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A
MANUAL OF MEDICAL TREATMENT
OR
CLINICAL THERAPEUTICS

WORKS BY DR. BURNEY YEO.

A Manual of Medical Treatment, or Clinical Therapeutics.
(Revised Edition.) *Two Vols.*

Food in Health and Disease.
(Enlarged Edition.)

The Therapeutics of Mineral Springs and Climates.

John H. Blodgett, M. D.
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A MANUAL

OF

MEDICAL TREATMENT

OR

CLINICAL THERAPEUTICS

BY

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with Formulæ adapted to the Standard of Strength of
Preparations employed in America,
by OSCAR OLDBERG, *Pharm.D., Dean of the School of*
Pharmacy of North-Western University, Member of the Committee
of Revision of the Pharmacopæia of the United States

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CONTENTS.

Part IV.

PHTHISIS, OR CONSUMPTION (PULMONARY TUBERCULOSIS).

(Continued.)

CHAP. PAGE

III.—CLIMATIC TREATMENT IN PHTHISIS 1

IV.—GENERAL MEDICINAL TREATMENT OF PHTHISIS . . 24

V.—SYMPTOMATIC TREATMENT OF PHTHISIS 56

VI.—TREATMENT OF COMPLICATIONS OF PHTHISIS AND THE SURGICAL TREATMENT OF PHTHISICAL CAVITIES 85

Part V.

DISEASES OF THE LIVER.

I.—TREATMENT OF GALL-STONES (CHOLELITHIASIS) 103

II.—TREATMENT OF JAUNDICE 126

III.—TREATMENT OF CONGESTIVE AND INFLAMMATORY AFFECTIONS OF THE LIVER. 1. HYPERÆMIC CONDITIONS. 2. ACUTE SUPPURATIVE HEPATITIS, ABSCESS OF LIVER. 3. CHRONIC INTERSTITIAL HEPATITIS, CIRRHOSIS 142

IV.—TREATMENT OF HYDATID CYSTS OF THE LIVER 171

Part VI.

URINARY AND RENAL AFFECTIONS.

CHAP. PAGE
I.—TREATMENT OF MORBID STATES OF THE URINE 179
II.—TREATMENT OF RENAL CALCULI AND THEIR CONSEQUENCES—HYDRONEPHROSIS—PYURIA—PYELITIS—CYSTITIS 209
III.—TREATMENT OF INFLAMMATORY DISEASES OF THE KIDNEYS—ACUTE AND CHRONIC BRIGHT'S DISEASE 228

Part VII.

DISEASES OF THE NERVOUS SYSTEM.

I.—TREATMENT OF DISEASES OF THE BRAIN AND ITS COVERINGS. 258
II.—TREATMENT OF DISEASES OF THE SPINAL CORD 283
III.—TREATMENT OF NEURALGIAS AND OF NEURITIS, LOCALISED AND MULTIPLE 318
IV.—TREATMENT OF MIGRAINE AND OTHER HEADACHES; AND OF INSOMNIA 354
V.—TREATMENT OF CHOREA AND OF PARALYSIS AGITANS . . . 384
VI.—TREATMENT OF EPILEPSY 401
VII.—TREATMENT OF HYSTERIA AND NEURASTHENIA 426

Part VIII.

CONSTITUTIONAL DISEASES.

I.—TREATMENT OF CHRONIC RHEUMATISM AND OF RHEUMATOID ARTHRITIS OR OSTEO-ARTHRITIS 456
II.—TREATMENT OF GOUT 481
III.—TREATMENT OF DIABETES 513
IV.—TREATMENT OF RACHITIS OR RICKETS; OF SCORBUTUS OR SCURVY; AND OF PURPURA 541

Part IX.

SPECIFIC INFECTIVE DISEASES.

CHAP.		PAGE
I.	TREATMENT OF ACUTE RHEUMATISM	556
II.	TREATMENT OF DIPHTHERIA AND WHOOPING COUGH	578
III.	TREATMENT OF THE ERUPTIVE FEVERS—SMALL POX—SCARLET FEVER — MEASLES — RÖTHELN — AND TREATMENT OF ERYSIPELAS	618
IV.	TREATMENT OF TYPHOID OR ENTERIC FEVER, AND OF TYPHUS FEVER	657
V.	TREATMENT OF INFLUENZA; OF MALARIAL FEVERS; AND OF TETANUS	699
VI.	TREATMENT OF CHOLERA; AND OF CEREBRO-SPINAL FEVER	739
	GENERAL INDEX	763
	PRINCIPAL AUTHORITIES QUOTED OR REFERRED TO	810

LIST OF ILLUSTRATIONS.

PAGE
Fig. 1.—Hot-air Bath 229
Fig. 2.—Tent with Spray Apparatus for Laryngeal Diphtheria . . 591
Fig. 3.—Chart of case of Influenza treated with Quinine . . . 703
Fig. 4.—Chart of case of Influenza treated with Quinine . . . 704
Fig. 5.—Vessel used for Intravenous Injections 755

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MANUAL OF MEDICAL TREATMENT.

Part IV.

PHTHISIS, OR CONSUMPTION (PULMONARY TUBERCULOSIS).

(Continued.)

CHAPTER III.

CLIMATIC TREATMENT IN PHTHISIS.

Difficulty in Selection of Climates—Cases unsuited to this Treatment—Qualities required in a suitable Climate—Purity of Air the Chief—Objects sought in Change of Climate—Division of Climates—Examples of each Division—Value of Change of Climate as a Prophylactic—Marine Stations—Sea Voyages—Mountain Stations—State of the Lungs, etc., as Indications for Selection of Climate—Disease Limited and Localised—South African Resorts—The long Sea Voyage—Climate of Altitudes and the "Alpine Cure"—Its Characters and Effects—Cases Suitable—Need for Discrimination in Selection of Cases—Intermediate Stations—Cases with more advanced and serious Lesions and Chronic Cases—Egypt—Pau—Amélie—Division of Marine Climates into Sedative, Stimulating, and Intermediate—Characters of each, and Cases suitable to them—Examples.

THE important part which **climate** plays in the treatment and progress of cases of phthisis is universally admitted. The application, however, of suitable climatic treatment to individual cases is often a question of some difficulty.

The choice of a particular climate for a particular case will, frequently, have to be determined by individual and personal rather than by general and pathological considerations.

When we reflect that cases of consumption are arrested in their course, and apparently cured, in such a climate, for instance, as that of Arcachon, on the coast of the Atlantic, and also in such an apparently utterly different climate as that of Davos, we are led to the conclusion that we must seek for some *special relation* between the individual to be cured and the particular climate that will suit him. And it is sometimes only by actual trial that such relation can be discovered.

Even in the application of knowledge derived from actual experience of certain climates we are often greatly disappointed, and the soundness of our judgment may in consequence be called in question by the embarrassing capriciousness of weather and the great variations of climatic conditions, in the same places, in different or successive seasons.

In the views, therefore, which we take of the influence and applicability of various climates in the treatment of different cases of phthisis, we should set ourselves free from the trammels of any narrow classification.

In connection with the recommendation of change of climate, the physician is often blamed for advising, or rather permitting, patients in advanced stages of phthisis to travel long distances, and to leave the comforts of home, when there is no reasonable hope of any decided benefit being thus obtained. No doubt the exercise of much judgment and discretion is needed in such circumstances, and while we should be especially careful not to impose useless fatigue and discomfort on our patients, and unnecessary expense and trouble on their friends, yet we must not forget that it is our duty to do what we can to render such life as is left to our patients as cheerful and bright as possible. The sadness and misery of the last few months of life are often greatly mitigated by removal from habitual surroundings which have become distasteful and wearisome, or from dull, cheerless city dwellings, to the contemplation of a landscape which presents all that is bright and beautiful in Nature, and where illness and even death are robbed of many of their saddest accompaniments.

It is, of course, almost unnecessary to say that cases of *acute phthisis* are not amenable to treatment by climate. Cases of rapidly progressing disease, especially with *diffused* infiltration on both sides, and considerable fever, are also to be excluded. All cases during attacks of hæmorrhage, of intercurrent pneumonia, bronchitis, or pleurisy, with notable rise of temperature, should be kept at home, and the need of complete physical rest in all cases with a daily rise of temperature of two or three degrees or more should be borne in mind. Cases presenting unmistakable evidence of progressive intestinal ulceration should not be permitted to travel.

With these exceptions most cases of chronic phthisis may be more or less benefited during some considerable part of their course by climatic treatment.

With regard to the selection of a particular climate, and the conditions to be looked for in it, the absolute or relative purity of the air is, without doubt, the condition of chief importance. Compared with this, questions of small differences of temperature or of humidity are of far less concern.

It must have occurred to every practical physician of some experience to see patients the subjects of chronic, stationary phthisis, with a good deal of bodily strength and activity, who for a long series of years will go from one health resort to another, differing materially in climatic characters, and will enjoy fairly good health in all.

We should learn from observations like these that we may allow some of our phthisical patients a great range of choice in the selection of a climate, provided it complies with the essential conditions of purity and asepticity of atmosphere.

We know that the air over the open sea, and the air in elevated regions, are alike in their freedom from the presence of organic impurities, and that although their climates may seem to be, in a certain sense, opposed to one another, yet that, in some important respects, they are similar.

If, now, we ask ourselves what it is we desire to effect when we make use of change of climate in the treatment of phthisis, we may hope to get a clear view of the problem before us.

In the *first* place we utilise change of climate as a *means of prevention* in cases in which we have reason to apprehend a tendency to this disease.

Secondly, in cases where the local mischief is limited and quiescent, and the constitutional condition is good, we look for a climate which will promote retrogressive, curative changes, and at the same time increase the patient's strength and restore him to perfect health.

Thirdly, in cases where the disease is more advanced, and the general health more gravely compromised, we desire to find a climate which shall contribute, if not to the retrogression, at any rate to the arrest of the disease, and to the restoration in some degree of the constitutional tone and vigour.

Fourthly, in still more advanced cases, where we have ceased to hope for any great general or local improvement, we desire to find a suitable place of residence favourable to the maintenance, if possible, of the *status quo*, and where the last years of the patient's life may be made as pleasant and comfortable to him as circumstances will permit.

Fifthly, we desire to find, in all these circumstances, comfortable, well-built, well-situated residences under the best hygienic conditions, with abundance of pure air and sunshine, and a dry soil, the means of obtaining a generous, nutritious, and varied dietary, and last, but by no means least, *suitable medical supervision.*

Let us next inquire what are the resources in the way of climate we have at our disposal for the purpose of meeting the foregoing requirements.

For our present purpose the first and simplest division of climatic stations will be into—

A. CLIMATES OF ALTITUDES.—Mountain stations; these being usually several thousand feet above the sea.

B. CLIMATES OF THE PLAINS.—Stations on or about the sea-level.

These two main divisions may be again subdivided into:—

A. (*a*) *Alpine climates.*—Mountain stations more than 4,000 ft. above the sea.
   (*b*) *Sub-Alpine or "intermediate" climates.*—Stations ranging usually from 1,000 to 3,500 ft. above the sea.

B. (*a*) *Inland climates.*—Stations in the interior of continents.
   (*b*) *Marine climates.*—Stations on the sea-coast, insular stations, and sea voyages.

We will now enumerate examples of all these, so that we may have the question before us in a concrete form.

A. CLIMATES OF ALTITUDES.

(*a*) *Alpine climates.*—The stations of the *Upper Engadine*, Samaden (5,580 ft.), St. Moritz (6,032 ft.), Pontresina (5,960 ft.), Campfèr (5,950 ft.), Maloja (5,880 ft.), etc.; *Davos Platz* (5,352 ft.); *Arosa* (6,100 ft.), near Langweis; *Wiesen* (4,770 ft.), in the Valley of the Landwasser, near Davos; *Andermatt* (4,730 ft.), on the St. Gothard Road; *Leysin* sanatorium, near Aigle (4,700 ft.).

(These are some of the chief Alpine stations *in Europe* which are, at present, available for invalids in winter as well as in summer.)

Of other examples, out of Europe, the following may be mentioned:—

Jauja and *Huancayo* (8,000 to 10,000 ft.), in the Peruvian Andes; *Santa Fé de Bogota* (10,000 ft.), the capital of the United States of Colombia; *Quito* (10,000 ft.), in Ecuador; *Cuzco* (11,250 ft.), in Peru; *La Paz* (12,000 ft.), Bolivia; *Mexico* (6,000 to 8,000 ft.); *Puebla* (7,215 ft.).

In the United States of America there are *Denver* (5,200 ft.), *Colorado Springs* (6,023 ft.), and *Manitou Springs* (6,223 ft.), in the Rocky Mountains of Colorado, and other less well-known resorts.

In South Africa, *Bloemfontein* (4,700 ft.), and the adjacent stations in the Orange River Colony, are the chief representatives of these Alpine climates.

(*b*) *Sub-Alpine or "intermediate" climates.*—There are but few European examples of this division available or suitable for winter as well as summer residence of consumptives. The chief are: *Grindelwald* (3,468 ft.), *Beatenberg* (3,700 ft.); *Mont de Caux* (about 4,000 ft.), *Les Avants* (3,212 ft.), *Glion* (2,400 ft.), and *Montreux* (comprising several villages of from 1,250 to 1,500 ft.), all four adjacent, on or near the Lake of Geneva; *Aussee* (2,145 ft.), in Styria; *Le Vernet* (nearly 2,000 ft.), in the Pyrénées Orientales; *Göbersdorf* (1,700 ft.), in Silesia, the well-known sanatorium, formerly under the supervision of the late Dr. Brehmer; *Falkenstein* (1,700 ft. about), in the Taunus Mountains, near Frankfort, also a sanatorium, like that of Göbersdorf, under the supervision of Dr. Dettweiler; *Nordrach*, in the Black Forest (1,400 ft.); *Meran* and *Untermais* (1,050 ft.), and *Obermais* (1,200 ft.), all three adjacent, in the Southern Tyrol.

To the above European resorts may be added the station of *Hammam R'irha* (2,000 ft.), in Algeria, and several resorts in South Africa (in Cape Colony and in the Orange River Colony).

B. CLIMATES OF THE PLAINS.

(*a*) *Inland climates.*—There are very few inland resorts (apart from those in mountain districts) that have been thought suitable for the residence of phthisical patients. The Valley of the Nile, in *Egypt; Pau; Amélie les Bains*, in the Eastern Pyrenees; and *Biskra*, in Algeria, may be mentioned.

(*b*) *Marine climates.*—Under this subdivision we have an immense variety of stations to choose from, which themselves need classification, according to their temperature and its periodical oscillations, their humidity, their protection or exposure to winds, etc.

On the English coast we have *St. Leonards, Ventnor, Bournemouth, Sidmouth, Torquay, Penzance, Falmouth, Tenby*, and others; in the South of France, *Arcachon* on the Atlantic coast, and the various resorts on the Western Riviera, together with the adjacent towns on the Italian Riviera; the many resorts in the islands of the Mediterranean: *Ajaccio* in Corsica, *Palermo, Catania, Taormina*, and *Acireale* in Sicily; Corfu, Capri, Malta; *Malaga* on the east, and *Huelva* on the west coasts of Spain; *Algiers, Tangier, Mogador*, in North Africa; the Island of Madeira; Grand Canary and Teneriffe in the Canary Islands; Southern California in the United States.

From these and others, as well as the resource of a **sea voyage,** we have a wide choice of resorts suitable to individual cases.

These few preliminary considerations place the problem of the climatic treatment of phthisis fairly before us, and we may now pass on to consider in detail the various questions which arise in their application to individual cases.

The most valuable means at our disposal for **preventing** the development of phthisis in individuals in whom the predisposition to this disease exists, either from inheritance or from previous catarrhal or other pulmonary attacks, or where the strength and resisting power of the constitution have been gravely compromised by severe attacks of acute disease, are those associated with change of climate.

In all such cases there is one essential and predominating condition to be fulfilled, as we have already said, and that is the selection of a climate in which an **out-of-door life** in fresh, pure air can be largely followed.

When we have to deal with this predisposition in scrofulous children and young people, we should especially recommend a life on the sea-coast, and when there is also a tendency to attacks of bronchial catarrh or pulmonary congestion, we should recommend, *in winter*, the choice of a *southern* marine station, when practicable. An abundance of sunshine and sea air is most serviceable in such cases.

A wide range of choice may be permitted. On the Riviera, Hyères, Cannes, Bordighera, and San Remo are, perhaps, the best stations for such cases; for excitable, nervous constitutions, Arcachon, Biarritz, and St. Jean de Luz are better. With regard to Biarritz, it must, however, be remembered that there is often a great deal of rain as well as severe winds to be encountered there in the winter, and it is not, therefore, well suited to cases in which catarrhal or other lung affection actually exists; and the life at Arcachon is dull for young people.

When, for other reasons, it may be more convenient, there is no objection in these cases to such winter stations as Gibraltar, Malta, Ajaccio, or Madeira.

On our own coasts Falmouth, Penzance, Bournemouth, Torquay, Ventnor, Tenby, St. Leonards, etc., are suitable resorts. Glengariff, on the south-west coast of Ireland, is also well suited to such cases. For young and fairly vigorous male adults, who are fond of the sea, one or two long sea voyages may be recommended.

Mountain stations, such as Davos and the Engadine, are especially suitable to cases or constitutions where it is desirable to remove an undue impressionability of the skin and mucous membrane, or where attacks of pleurisy or pleuro-pneumonia have been imperfectly recovered from, or where pleuritic adhesions hinder the complete expansion of portions of lung; the lung gymnastics which residence in these altitudes enforces are exceedingly useful in removing these conditions.

Young, vigorous adults belonging to this category may also be allowed to undertake an active out-of-door life in the various resorts in the elevated inland districts of Cape Colony, and especially the Orange River Colony in South Africa, or in suitable parts of Australia and New Zealand.

As we have already said, a very wide range of choice, according to individual tastes, requirements, or peculiarities, may be permitted to the cases that fall under this head.

We have next to consider the cases in which local mischief actually exists, but is **limited** and **quiescent**, and the constitutional condition good. In such cases of phthisis there are two chief objects to consider: first, the extent of diffusion of the more or less active specific infective agent; and, secondly, the various modes of reacting to its inroads presented by the different constitutions it invades.

We recognise, in this way, two extreme types. There is, at one extreme, the constitution which succumbs immediately, and offers no kind of resistance to the infective invading organism, through whose tissues it spreads with amazing rapidity; these form the cases of so-called "acute phthisis," or "acute pulmonary tuberculosis."

At the other extreme we find constitutions which strongly resist the invasion of the infective organism, whose tissues appear to oppose its inroads, and lend themselves unwillingly to its diffusion. These are cases of very slowly advancing chronic phthisis; *chronic*, if one may say so, from its commencement!

Between these two extremes we encounter very various degrees of acuteness and chronicity, corresponding with the various degrees and modes of reaction of the constitution, or of the tissues invaded, to the invading parasite. It is also possible that there may be varying degrees, within wide limits, of amount and virulence of the invading bacillus.

There are three easily ascertainable conditions which afford us a sufficient guide for the practical purpose of determining questions of climate; these are:

1. The local extent of disease, as ascertained by physical signs.
2. The rate of progress of the local disease and the mode of reaction of the constitution, as indicated by the amount of fever.
3. The presence of other pre-existing and co-existing morbid states or tendencies.

In considering the best kind of climate for those persons with a small, limited, local area of disease, little or no fever, good appetite and digestion, and plenty of physical vigour, and no complications, we must take into account other circumstances affecting the individual—such as age, sex, occupation, position in life, and personal tastes and peculiarities.

Young males accustomed to and fond of an active agricultural life, and not averse from a little "roughing it," may be recommended to one or other of the many stations in the elevated plains of South Africa—in Cape Colony, the Orange River Colony, or the Transvaal—where they will encounter a climate well adapted to this kind of life, one that has brought complete restoration of health to many.

The environs of Cape Town, such as Wynberg and Kalk Bay, are especially suitable for summer residence (October to March), when the air is dry and pure, and the heat moderate. The invalid must not stay here during the winter, when there is much rain and a moist atmosphere, with frequent mist and fogs. Of inland resorts, Ceres is one of the most accessible; it is 1,700 feet above the sea-level, and only 84 miles by rail from Cape Town. At a short distance from this village is an elevated plateau 2,700 feet above the sea, with a fine, dry winter climate. Its climate in winter is not, however, so good as that of some of the higher and more distant stations, but it serves as a good intermediate station for those arriving from Europe. One of the best of the higher resorts is the Cradock district, 3,000 feet above the sea, on the main line of rail between Kimberley and Port Elizabeth, and about 180 miles from the latter.

In the Orange River Colony, which is an elevated plateau from 4,000 to 5,000 feet above the sea, with a remarkably dry climate, there are several resorts well suited for such cases as those we are considering. Bloemfontein, its capital, and Bishop, which is more accessible, are both suitable places of residence, and the latter is said to have "rarely a single wet day in the year."

These are all excellent resorts for cases of early phthisis in persons of otherwise good health, and possessing abundant capability of taking active exercise, and following an out-of-door country life. The disease should be limited, non-progressive, and quiescent, or but very slowly advancing, and with little or no fever; in many such cases a complete restoration to health and activity may be looked for, so long as the invalid remains in such a climate. But South Africa should not be recommended to delicate persons who are dependent on luxuries and comforts, and quite incapable of "roughing it." Greatly changed conditions of life may fairly be anticipated in these colonies now that they are wholly under British influence.

One or two long sea voyages, or a sea voyage to Australia or New Zealand, followed by an out-of-door life in suitable parts of the interior of these colonies, may be recommended to the same class of cases. We have not seen much advantage, but often great disappointment, follow the recommendation of sea voyages in more advanced cases, and in our own practice we never advise a long sea voyage except to vigorous young males, who like the sea, and have only a small extent of local disease.

In a long sea voyage to the Antipodes there are obviously many possible circumstances which, if encountered, may prove injurious to invalids.

The resource of a sea voyage should, therefore, be reserved for the young and hardy patient who may be suspected of a phthisical tendency, or who may have some slight apical mischief, on one side, with little or no general constitutional disturbance. It is especially appropriate to those who are fond of the sea, and to those who may have opportunities of settling advantageously in the distant colonies of Great Britain. But serious hardships and disasters have frequently been the result of the indiscriminate prescription of a sea voyage.

The climate of altitudes, the "Alpine cure," is well adapted to the same class of cases, in somewhat altered circumstances, as the long sea voyage; but it is also adapted to a much larger group of cases, to many cases in which it would be out of the question to recommend a sea voyage.

Immunity from consumption does not follow any particular level of elevation, and the *mere amount* of elevation is not so essential as has been supposed. The altitude of immunity varies in different latitudes. In the tropics it is necessary to ascend to an elevation of between 8,500 and 9,000 feet. In the Higher Pyrenees we are assured that at elevations varying from 1,760 feet (Bagnères de Bigorre) to 4,580 feet (Gavarnie), phthisis is equally rare. In Switzerland, some localities not more than 3,000 feet above the sea appear as free from phthisis as others of twice that elevation; and Dr. Brehmer asserted that in the neighbourhood of Göbersdorf, in Silesia (1,700 feet), he had never seen phthisis amongst the inhabitants; from which it would seem that the freedom which any particular locality may appear to enjoy from this disease is independent of its mere elevation, and due in part to other conditions. One of these conditions is undoubtedly entire physical purity of the respired air, the absence of microbes and other septic contamination. The localities which enjoy immunity from phthisis are characterised by the possession of a pure, dry, aseptic atmosphere, a dry subsoil, and a scanty population.

But in a truly Alpine climate, at an elevation of 5,000 feet or over, as that of Davos or the Upper Engadine, other conditions come into operation.

Besides being pure, dry, and aseptic, the air is rarefied, cold, and antiseptic. It is also peculiarly still in winter (or rather, we should say, in a *good* winter), and free from local currents, and the sunlight and heat, owing to the perfect clearness and transparency of the atmosphere, are intense.

We may summarise the physical agencies to which the invalid is submitted in these elevated regions as follows:—

1. Extreme purity of air and freedom from floating particles, especially of organic germs.

2. Great dryness of the air and of the soil, and therefore an unusual freedom in winter from mist and fog.

3. Low barometric pressure and corresponding rarefaction of air.

4. Low temperature of the air (great cold in the shade), with great solar radiation or sun-warmth, which warms absorbent bodies exposed to its rays without heating much the air itself.

5. Great intensity of light during the hours of sunshine.

6. Remarkable stillness of the air in winter. (There is much more motion of the air, especially from local currents, in summer.)

7. An increased amount of ozone.

Many theoretical views have been advanced with the view of accounting for the action of the cold, rarefied air of these elevations on the human body; none of these has been altogether satisfactory, and we shall, therefore, confine ourselves in this place to noticing the effects observed to be produced in suitable subjects. These have been:

1. Increase of appetite, and improvement in the general nutrition and blood-making processes.

2. Increased tone of the heart and circulation.

3. A general increase of muscular capacity and nervous energy.

4. Increased ventilation of the lungs, owing to quickening and deepening of the inspirations, and the large quantity of pure, fresh air thus passed through them.

The amount of cold, dry air inhaled tends to a loss of heat, and so to diminution of fever, while the dryness of the air causes a considerable loss of water from the pulmonary surface, which, besides promoting the circulation through the lungs, tends to diminish secretion, so that moist catarrhal sounds disappear, and expectoration is diminished.

It has been said that in the process of amelioration and cure the diseased parts of the lung become compressed by "emphysematous" dilatation of the surrounding tissue; but it seems more probable (as it is certain that the circumference of the chest becomes increased from prolonged residence in these localities) that the permanent lung expansion is due to more complete dilatation of groups of air-cells which, probably, are little used in ordinary respiration on the sea-level, and so the whole lung expands within certain possible limits, and naturally fills up the space yielded by contracting, cicatrising lung substance.

The cases suitable for treatment in these elevated regions must be selected with great care and discrimination; and regard must be had rather to the constitution and temperament of the individual than to the mere amount of local disease. Hereditary predisposition, other circumstances being favourable, offers no counter-indication to the suitability of these stations. But their remedial power is especially manifested in persons who have become accidentally the subjects of chronic lung disease, and who were the possessors of an originally sound constitution, and have obvious reserve stores of physical vigour: the constitution must have the power of healthy reaction to the exciting stimulants here applied to it.

In cases in which there is an obvious and well-ascertained *predisposition* to consumption, and where perhaps a slight hæmorrhage has occurred without the manifestation of any definite local disease, as a *preventive* measure a residence for two or three seasons in a high mountain station is to be recommended.

In apical catarrhs in young people, especially in the early stage, without much constitutional disturbance, the best results may be looked for if the treatment is commenced in the summer. But cases, febrile from the commencement, and of nervous and excitable temperament, must not be sent to high altitudes.

Chronic inflammatory indurations and infiltrations of limited portions of the lung, often the result of acute congestion and inflammation, are especially suitable; not so, however, if a considerable extent of lung is the seat of tuberculous disease, or if, owing to the extent of lung involved and consequent changes in the sound lung, there is much *dyspnœa.*

We have, however, observed that advanced chronic cases, when the disease, though advanced, is limited to one lung, and there is little or no fever, and a certain amount of muscular activity and nervous energy is retained, often do well in these mountain stations; they will live there in tolerable comfort for years, losing ground, however, immediately they descend to lower regions.

Certainly chronic one-sided cavity cases, in fairly vigorous young subjects, with a tendency to fibroid changes in the surrounding lung, form very suitable and hopeful cases for high altitudes. Contraction of the cavity and cicatrisation of the surrounding lung substance, with expansion of the adjacent healthy lung tissue, often take place with considerable rapidity.

The following is Sir H. Weber's classification of *unsuitable* cases:—"(1) Consumptive patients who belong to what I have described as the erethic constitution, whether the affection is early or advanced; (2) phthisis in a very advanced stage; (3) phthisis complicated with emphysema; (4) phthisis complicated with albuminuria; (5) phthisis complicated with disease of the heart; (6) phthisis with ulceration of the larynx; (7) phthisis with rapid progress and constant pyrexia; (8) phthisis with great loss of substance; (9) phthisis with considerable empyema; (10) phthisis in persons who cannot sleep or eat in high elevations, or who feel constantly cold."

In this last group we are again brought into contact with individual peculiarity as a determining condition in the choice of climate; for the members of this group, who cannot exist in comfort and whose nutrition is compromised in Alpine stations, we have to seek other residences; some of these may do well in the so-called "intermediate" stations, such as Montreux, Glion, Meran, Göbersdorf, Aussee, etc., while others will find the warmer and more sunny climate of the stations of the Western Riviera more suitable.

Very little is at present known of the results attending the wintering of phthisical patients at **intermediate** stations. The Hôtel des Avants (3,200 feet) above Montreux, and the Kurhaus of St. Beatenberg (3,700 feet), and the Bär Hotel at Grindelwald, have only of late years been kept open through the winter, and further experience is needed before it is possible to pronounce a judgment as to the suitability of those places as winter resorts for the phthisical. Meran (about 1,000 feet) has a cold, dry, sub-Alpine winter climate, and many invalids with chest affections winter there with benefit. The Kurhaus there is provided with an excellent system of compressed air baths, and regular pneumatic treatment forms a part of the course carried out. The several adjacent villages which compose Montreux, at the eastern extremity of the Lake of Geneva, have been found suitable winter stations for a few cases of chronic phthisis in fairly vigorous persons, who find that a cold, moderately dry pure air suits them best in winter. Innsbruck also is suitable for such cases.

We have mentioned that there are many suitable stations for consumptive patients at considerable altitudes in the American continent, for those who do not mind travelling as far as the Peruvian Andes, the Cordilleras, or the Rocky Mountains of the United States. Sir H. Weber mentions that several of his patients "have recovered from rather advanced affections of phthisis" in the neighbourhood of Jauja and Huancayo, at elevations varying from 8,500 to 10,500 feet. These are the two chief resorts for consumptive patients from Lima. The climate of these stations is much more genial, and altogether very unlike that of the Swiss Alps at considerably lower elevations. The equability of temperature at Jauja is very remarkable; the range during the whole year has been observed "not to exceed from 50° to 59° or 60° F.; with the sky always clear and sunny, and an atmosphere pure and bracing." "From no other localities," says Sir H. Weber, "have I seen such good results as from Jauja."*

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* Croonian Lectures.

Denver (5,200 feet), in the Rocky Mountains, presents special advantages as a residence for a certain class of consumptives, for those we mean who cannot afford to lead idle lives, and who possess sufficient strength and energy to enable them to engage in active business pursuits. It is the capital city of the State of Colorado, and the chief business centre of the Rocky Mountain plateau. But for those who do not wish to engage in business pursuits, and whose sole object is the restoration of health, Manitou (6,200 feet) and Colorado Springs (6,000 feet) offer superior attractions, as places of residence, to those of Denver.

We have next to consider what are the best resorts for cases of phthisis in a **more advanced stage** than those we have been thinking of, or with the general health more seriously compromised; as well as for those persons who, from individual peculiarity or other good reason, cannot support the climate of altitudes, or the more hardy life involved in a sea voyage, or settlement in an out-of-door life in one of the British colonies; resorts which may contribute, if not to retrogressive changes, at any rate to the arrest of the disease, and the restoration, in some measure, of constitutional tone and vigour. The resorts we now have to consider will also frequently have to be made use of for cases of threatening disease in feeble constitutions, as well as for those lingering, advanced cases of chronic phthisis in which all hope of restoration to any kind of vigorous or active life is past, and in which our only hope is to maintain, if possible, the *status quo*, and to provide a refuge where the last years of the patient's life may be made as pleasant and comfortable as possible.

The extremely dry winter climate of Upper Egypt and Nubia, and the expedient of a voyage up the Nile in a dahabeeah has, certainly, proved of great value to many sufferers from chronic phthisis. From November to April the climate of Egypt used to be considered "the finest in the world," but since

46

attention has been so strongly diverted to mountain stations the Nile voyage has come to be regarded with much less enthusiasm, and the long and expensive journey from England has always presented a difficulty, insurmountable in many cases.

The sea voyage, the shortest, from Brindisi to Port Said, of three days, is also an obstacle to many. The winter climate of Egypt is suitable to cases of chronic, stationary phthisis in persons of torpid or scrofulous constitution, with catarrhal tendencies, who are active enough to enjoy travel. The command of a certain amount of means is also necessary, and if they venture on the Nile voyage they should be accompanied by a medical attendant. They should be cautioned about remaining long in Cairo, where the dust and dirt may prove injurious; but good accommodation can now be obtained at Heluan les Bains, a few miles from Cairo, and in the hotels at Ména and Luxor.

Pau has also an inland climate, but with very different characters from that of Egypt. Pau has a moist, sedative climate, Egypt a dry, exciting one. Remarkable stillness of atmosphere is considered to be the chief characteristic of the climate of Pau. It has a large rainfall, and a goodly number of rainy days. Its average winter temperature is but little higher than that of London—viz. 43·2° F., and it is occasionally visited by severe storms, and frost and snow are by no means uncommon in winter. It must be remembered that its climate is sedative, not bracing, and that its special suitability is to phthisical patients whose disease is quiescent, with irritable nervous symptoms, and a tendency to febrile excitement.

It is an agreeable place of residence, and has many social attractions. Its adjacency to the several Pyrenean summer resorts and sulphur spas is convenient for a large class of invalids who pass their winter at Pau and their summer at Eaux-Bonnes, Bagnères de Bigorre, or some other Pyrenean bath.

Amélie les Bains is another inland winter resort for the phthisical, almost exclusively frequented by French and Spanish patients. It is close to the Spanish frontier in the Eastern Pyrenees. It lies in a protected situation at an elevation of 700 feet above the sea; its climate is intermediate in character between the sedative one of Pau and the more exciting one of the Riviera. It is warmer than Pau, but has more wind, and its temperature is less equable. It has hot sulphur springs, and it is, therefore, a convenient winter resort for patients with phthisis who desire to combine the use of sulphur waters with a mild winter climate. Life at Amélie is very simple and inexpensive. One of the largest military hospitals in France has been established there.

The **maritime**, insular, or littoral climates convenient and suitable as winter resorts for the phthisical, may be divided into three groups:—(*a*) sedative marine climates; (*b*) stimulating marine climates; and (*c*) intermediate climates.

The practical selection and applicability of these climates must be determined rather by considerations of constitutional and individual peculiarities than by considerations drawn from the physical changes in the lungs. The influence of climates and their reactions on certain individuals are so subtle that it is scarcely possible to determine absolutely, before actual trial, in these doubtful cases, whether a particular resort will be found suitable or not.

The *sedative* group are characterised by greater equability of temperature, greater freedom from strong winds, a considerable amount of relative humidity, and generally a tolerably large rainfall distributed over a considerable number of rainy days. The *stimulating and tonic* group present wide diurnal variations of temperature, and considerable difference between sun and shade temperatures, a great fall of temperature at sunset, relatively cold nights, great sun heat, frequent high winds, a small winter rainfall, and relative dryness of atmosphere.

The characteristics of the third or *intermediate* group are sufficiently indicated by their designation; it is, however, scarcely necessary to say that some examples of this group approach more nearly to the sedative, and others to the stimulating class.

So far as it is possible to generalise in this matter, it may be said that the climates of the sedative group are best suited to nervous, irritable constitutions, those who sleep and digest badly in exciting air, whose mucous membranes are irritated by sudden changes of temperature and exposure to strong winds, or by excessive dryness of atmosphere.

The *stimulating* tonic group are best suited to young, anæmic cases, and to torpid, scrofulous constitutions, in which the variability of temperature, the dry air, the bright sunshine, and the changing winds serve as stimulants to the languid circulation, and promote nutrition and sanguification; while the *intermediate* group form a very valuable class of climates applicable to a wide range of cases, in which there is no very strongly marked individual peculiarity, certain members of this group being applicable to the same cases as the other two, according as they approach in their characteristics the one or the other division.

A brief reference to the principal examples of these groups will suffice to guide the practitioner in the selection of a suitable resort.

On the English coasts the winter resorts suitable for phthisical patients belong most of them to the sedative class, differing slightly from one another, but not greatly. Those to the west—Falmouth, Penzance, Torquay, Tenby—are more sedative than those to the east—as Ramsgate, Hastings, and St. Leonards; while Ventnor, Bournemouth, Sidmouth, and Teignmouth may be regarded as intermediate.

Patients who do not tolerate too close proximity to the sea can, at Bournemouth and Torquay, find suitable accommodation at some distance from the shore. The sandy soil and the pine woods of Bournemouth confer on it some special qualities; the rainfall rapidly drains away through the porous soil, and leaves the atmosphere therefore somewhat drier than it otherwise would be, and the pine trees give out balsamic emanations in warm sunshine—both circumstances favourable to catarrhal cases and cases of laryngeal irritation.

St. Leonards is specially adapted to those persons who complain that they find the atmosphere of Torquay and Bournemouth too relaxing, and who derive positive benefit from a somewhat more bracing quality of climate.

The success that has attended the treatment of a great number and variety of phthisical patients at Ventnor, in the admirably-arranged and well-conducted Hospital for Consumptives established there, shows that its winter as well as summer climate is well suited to the majority of cases of chronic phthisis.

Arcachon, on an enclosed sea basin, a few miles from the south-west Atlantic coast of France, is applicable to much the same class of cases as is the English resort, Bournemouth. It has a decidedly sedative climate, but it cannot be said to be relaxing, as the winds and storms from the Atlantic blow over it, and at times keep up a good deal of agitation in its atmosphere. The winter residences are, however, protected to a great extent by the pine woods amongst which they are built. It is a rather dull resort to pass the winter in, but it has the advantage of being easily got at and easily left.

Biarritz is far too windy, wet, and stormy a climate for the average phthisical patient to think of wintering in.

One of the most perfect of sedative marine climates is that of Madeira, with its warm, moist, and equable atmosphere, exceedingly suitable to certain forms of phthisis, especially those with a tendency to bronchial catarrh and irritability. It has the further advantage of enabling patients to ascend during the warmer season to residences at various elevations above the sea, up to 2,000 feet or more, so that certain patients can remain there the whole year —an important consideration in many cases.

Mogador and Tangier, in Morocco, possess much the same climatic characters as Madeira, with a somewhat drier atmosphere, and somewhat less sedative qualities. Fair accommodation may be obtained at the latter resort, but it would not be prudent to rely on finding suitable provision for invalids at Mogador.

Malaga would be an admirable resort for many cases if it were not so ill provided with suitable means for invalids to live an open-air life.

Of late years Orotava and Guimar, in the Island of Teneriffe, have been advocated as good winter stations for the phthisical. Teneriffe is situated about twenty-eight hours' journey from Madeira, and, like that island, presents the possibility of residence at varying degrees of elevation above the sea, and has extremely beautiful and picturesque surroundings.

Las Palmas, in Grand Canary, has a drier and more bracing climate, and is preferred, therefore, by some. Occasional dust storms there are said to be trying.

Ajaccio, Palermo, Taormina, Acireale, Catania, Corfu, Capri, are examples of intermediate climates suitable for cases of chronic stationary phthisis that find the resorts of the Riviera too dry and exciting, and yet require a drier atmosphere than that of Madeira.

The climate of Algiers is also an example of the intermediate group, and is applicable to a great number of cases. The agreeable situation of its suburb—Mustapha-supérieur—where most invalids take up their abode, combines the advantage of life in the country with the adjacency of a large town. It is possible, too, to stay through the entire year in Algiers, either by removing to Hammam R'irha during the hottest months of summer, or by remaining in the highest part of Mustapha.

Biskra, for those who need a warmer and drier climate than Algiers in winter, is readily reached from the latter.

The various resorts on the French and Italian Riviera present us with examples, differing in certain degrees from one another, of the stimulating and tonic group.

We have already pointed out their characteristics, and the class of cases to which they are applicable.

Finally, we will only add that, according to the mode of life followed by the phthisical patient, he may make *bad* use of a *good* climate, or *good* use of a *bad* one, and that *care* without climate is better than *climate* without *care!*

CHAPTER IV.

THE GENERAL MEDICINAL TREATMENT OF PHTHISIS.

Classification of Cases of Phthisis according to their Amenability to Treatment—Conditions of Curability—The Use of Antiseptic Agents.—By Inhalation in Inhalation Respirators—Iodine—Ethyl Iodide—Iodoform—Creasote and Guaiacol—Various Modes of their Administration—Inhalation of Creasote Vapour in compressed Air—Thiocal—Duotal—Creasotal—Turpentine—Chloroform—Eucalyptol—Menthol—Myrtol—Oxonised Oxygen—Igazolo—Intrapulmonary Injections—Intravenous Injection of Hetol or Sodium Cinnamate—Formalin—Tuberculin—Antitoxic Serum—Nuclein and Nucleinic Acid—The Alkaline Hypophosphites—Arsenic—Iron—Cod-liver Oil—Glycerine—Mineral Waters. Additional Formulæ.

THE modern tendency to rely mainly on reginiinal means in the treatment of phthisis, that is to say, on measures mainly directed to improvement of the general nutrition of the patient and the raising of the power of resistance to the infective organism which is the exciting cause of the disease, has led us to precede the consideration of the various medicinal modes of treatment that have been, from time to time, advocated as remedies for consumption by a review of the most approved reginiinal and climatic measures. We must now attempt to form a just estimate of the many medicinal agents which have been credited with the power of curing or arresting pulmonary tuberculosis.

Such a just estimate will depend on our realising the fact that, from the point of view of **treatment**, cases of pulmonary phthisis may be roughly classified into—

1. The curable.
2. The remediable.
3. The irremediable.

It is in the nature of pulmonary tuberculosis if unchecked, to cause progressive destruction of the organ it attacks. If any portion of the structure of the adult lung is destroyed, as Virchow has recently urged, it can never be restored to its former state of integrity. If a large portion is destroyed, it must ever remain so. This inevitable fact seems to be constantly lost sight of by many modern writers on the cure of phthisis. It is clear, then, that the restoration of a lung to its former state of integrity in a case of pulmonary tuberculosis must be of rare occurrence, and if we are to *cure* phthisis, in the generally accepted sense of the word "cure," we must, whatever our remedy may be, treat it in its earliest stage, before it has led to any considerable destruction of lung tissue; but we may *arrest the course* of the disease, and so *remedy* cases, even when the disease is somewhat advanced, and subsequent retrogressive and protective anatomical changes in the lungs may restore the patient to a fairly active and useful life.

But there is yet another condition other than the amount or stage of the local disease which will determine the result of treatment and the classification of the case in regard to it: and that is the natural power of resistance in the organism to the infecting agent.

A physician who has had a large experience of cases of phthisis often, in his own mind, feels inclined to regard a case as probably irremediable, although he may be consulted at the very earliest appearance of local physical signs. He sees profound constitutional disturbance, and he fears the disease will run a rapid course, do whatever he may. These are cases of acute and sub-acute phthisis. In these cases, we may believe either that a considerable diffusion of the infective organism has taken place before the development of any recognisable physical signs, or that the invading organism has been unusually abundant in amount or of exceptional virulence.

It should, therefore, be remembered that a remedy which may be most efficacious in the earliest stage of phthisis is not, in the slightest degree, less a remedy for phthisis because it fails to produce any great result in more advanced cases, or under more unfavourable conditions, either of original constitution or virulence of infection.

Whatever observations we may make with respect to the treatment of phthisis must be regarded as always qualified by the preceding considerations; and we would counsel those who may have to consider the subject of remedial agents in phthisis to keep these truths in their minds.

Briefly, then, the **conditions favourable to cure** in cases of phthisis are these:—(1) *Early recognition* of the disease, when the tubercular lesions are small and isolated. (2) The *early occurrence* of hæmoptysis we regard as not an unfavourable condition, chiefly because it calls attention in a striking manner to the existence of this early stage; for it may happen that we can detect few, if any, characteristic physical signs in the lungs at the time of these early attacks of hæmorrhage. (3) A natural tendency in the evolution of the tubercular infiltration to *sclerotic* or *fibroid* changes is a very favourable condition; this tendency may be found pre-existing in the constitution, and may lead to spontaneous cure, or it may be promoted by suitable treatment; such a tendency is often observed in the gouty and rheumatic constitutions. (4) The absence of great tissue sensitiveness or irritability; the absence of that tendency to acute inflammatory reaction to the bacillary infection, the presence of which is so unfavourable a prognostic. (5) The absence of hereditary predisposition, and the possession of a sound, vigorous constitution, which has become accidentally infected with the tubercle bacillus. (6) A mitigated virulence of the bacillary infecting agent, and the small quantity or number that originally gain access to the lungs, and their access through the air-passages rather than through the vascular channels. We have dwelt more fully on these conditions elsewhere.*

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* "The Conditions of Cure in Consumption,' *Brit. Med. Journal*, Jan. 16th, 1892.

The use of antiseptic agents.—We have already formulated the following as one of the indications for the treatment of pulmonary consumption:—

"To endeavour, *so far as possible*, to antagonise the influence of the infective organism on the lung tissues and on the constitution. To attempt to hinder its extension to the sound parts of the affected lung, and also to the sound unaffected lung, and to prevent the infection of other organs."

It is impossible, in the rational treatment of phthisis, to lose sight of the fact that there is an infective organism not only developed and developing in the lung, *but actually diffused through the mucous* and *muco-purulent secretions in the air-passages*, and in advanced cavity cases we have other infective organisms also present, and the conditions of mixed infection to counteract.

We know that the tubercle bacillus, in the vast majority of cases, reaches the lung from without, that it is taken in with the inspired air, and finding in the lung the conditions suitable to its existence and multiplication, it lives and multiplies there. Now, if we could alter or disturb those conditions, we might hope, if not to arrest its vitality, at any rate to modify and diminish its morbid activity.

There are two channels by which we can attack and influence the infective organism in pulmonary phthisis: one is the very same channel by which it most commonly gains access to the organism, the air-passages of the lungs; the other is the blood.

There are also two conceivable methods by which we may influence the life and activities of this bacillus in the lung:—

1. By producing conditions more or less directly hostile to its existence: *i.e.* directly anti-bacillary, although we have recently been informed by Strauss that "dead tubercle bacilli preserve an energetic deleterious action"—in that case it is the neutralising of their activities that is of chief import.

2. By increasing the resisting power of the pulmonary tissues to its attack.

But it will naturally be asked what has been the practical gain from the use of antiseptic remedies. It is possible to get good results, or no results, from the use of antiseptic agents, according to the amount of judgment exercised in the selection of cases, according to the amount of sincerity, intelligence, and discrimination with which we employ the agents at our command, and according to the amount of co-operation and good faith we encounter in our patients.

We shall often find it impossible, with phthisical patients, to induce them loyally to follow any plan of treatment which requires constant trouble and attention; and it is extremely difficult to induce patients to breathe almost continuously an antiseptic medicated atmosphere of sufficient concentration and with sufficient continuance to be of any real efficacy.

Since using antiseptic inhalations in the treatment of phthisis we find, even in fairly advanced cases, that when used continuously the progress of the disease is rendered much slower and quieter; and, compared with our former experience, we find the extension of the disease to the unaffected lung is remarkably delayed. Indeed, it is in preventing the extension of the disease to the hitherto sound lung, and in preventing laryngeal infection, that we consider this method so valuable and so important; but to expect that any form of antiseptic, or any mode of its application, will cure advanced cases is to expect the impossible, and no such results ought ever to be claimed from their use. Improvement locally and generally and prolongation of life are all that can be expected when lung destruction has advanced to a considerable extent.

Wilson Fox, who was by no means an enthusiast in these matters, says: "There can be no question that inhalation practised in this manner,* with creasote, thymol, eucalyptus, iodoform, iodine, or terebene, tends to diminish cough and expectoration, and that in some cases marked improvement in the patient's state occurs during their use, even in very advanced stages."*

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* By means of inhalation-respirators.

Dr. Frederick Hicks, when resident medical officer to the Brompton Hospital, in a communication to the Harveian Society, spoke thus of his own personal experience: "To obtain the greatest good from antiseptic inhalations, a patient must devote himself very thoroughly to the treatment. Respirators should be worn almost continuously. . . . All patients testified to their use in allaying cough. This effect might be due to merely a sedative action, but also the more probable explanation was that the antiseptic caused diminution of the irritating qualities of the sputum. If this were so, then antiseptic inhalations were rendering a real service in therapeutics."

Professor M'Call Anderson, Professor Oertel, Dr. J. Solis Cohen, of Philadelphia, Professor Dreschfeld, Professor Semmola, Dr. Coghill, of Ventnor, Sir Wm. Roberts, Dujardin-Beaumetz, Dr. Shingleton Smith, Mr. Mayo Robson, and many others have testified to the value of antiseptic inhalations in phthisis.

It would be unnecessary to quote these authorities were it not for the senseless opposition to their use maintained by certain authors.

The following are the chief volatile antiseptic substances that have been used for inhalation: carbolic acid, creasote, turpentine, terebene, sanitas oil, camphor, iodine, thymol, menthol, formalin, certain essential oils (cinnamon, peppermint, etc.), iodide of ethyl, eucalyptol, oleum pini sylvestris, and iodoform dissolved in ether.

Any of these may be used of suitable strength, either alone or in combination. Many may be used in the "dry" form, that is, dropped on the dry sponge of an inhalation-respirator; or in dilute solution or emulsion in the form of a steam-spray, by means of a Seigle's spray-producer; or they may be diffused through an apartment by wetting cloths with them and suspending them in the room, or by pouring them on hot water, or on metal plates heated by a spirit lamp, or by playing a hand-spray about the room—these and various other simple ways will suggest themselves to everyone.

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* "Diseases of the Lungs," p. 881.

We find equal parts of creasote and spirit of chloroform, or equal parts of carbolic acid and spirit of chloroform, on the whole, the most useful; but some patients much prefer the eucalyptol vapour. Iodine we have found very useful in some cases where the creasote vapour had but little effect.

Dr. Coghill recommended for inhalation a tincture of iodine made with sulphuric ether instead of spirit of wine, and he prescribed also a combination with carbolic acid, according to the following formula:—

℞ Tincturæ iodi ætherialis	āā ʒij.
Acidi carbolici	
Spiritus vini rectificati	ad ℥j.

Misce, fiat inhalatio.

As to the best method of inhaling these vapours: of the perforated zinc inhalation-respirator devised by us for this purpose, and described at vol. i., p. 545, Dr. S. Solis Cohen says: "The lightness of this appliance, its cheapness, and its cleanliness commend it as the best device for the purpose offered to the profession." "It is one of the most useful, as it is one of the simplest, devices for the inspiration of medicinal vapours."

Dr. Coghill found that great caution requires to be taken with iodine for purposes of inhalation. There seems to be a tendency for it to induce slight hæmoptysis, so as to colour the sputa in tubercular cases, when used too freely. But in purulent bronchitis, bronchorrhœa, and broncho-pneumonia it will be found safe and efficacious.

The *inhalation of* **iodine** *vapour*, diffused in greater or less proportions through the respired air, is quite an old expedient in the treatment of phthisis, and it is thought by many that much of the value of applications of iodine to the surface of the chest is due to the inhalation of the vapours given off. We have already quoted a formula for the inhalation of iodine in combination with other antiseptics. S. Solis Cohen considers the inhalation of *ethyl iodide* one of the best means of conveying iodine into the air-passages. He considers it of "special benefit in ulcerative laryngitis, and in assisting the disinfection and healing of pulmonary cavities."

But many of these antiseptic substances have been administered in other ways. **Iodoform** has been largely given internally, as well as by inhalation, in phthisis. Prof. Dreschfeld, of Manchester, was one of the first to advocate its use. He gave it in the form of pills (iodoform 1 grain, croton chloral 2 grains, creasote 1 minim), and inhalations (iodoform 20 grains, oil of eucalyptus 20 minims, or creasote 10 minims; rectified spirit and ether, each ½ an ounce). If the pills were not well borne, it was given in cod-liver oil. He suggests also that in the case of young children it may be used as an inunction, made with olive oil or vaseline—a very useful mode of administering this and other remedies too much neglected. He found older children took it well in powders or pills. In laryngeal phthisis he thought it very useful, especially when applied locally to the ulcers in the form of powder. The results of his observations were that it produced (1) increase of weight; (2) increase of appetite; (3) diminution of cough and expectoration; (4) diminution, or even total cessation, of night sweats; (5) frequently some reduction of temperature.

Wilson Fox had obtained "favourable results" with it "in a few cases."*

Dr. Shingleton Smith, of Clifton,† considers that many cases of advanced phthisis were arrested by its use, and that incipient cases were cured. He gives from 1 to 5 or 6 grains five times daily. He thinks 30 grains daily is the limit beyond which it may not be safe to go.

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* "Diseases of the Lungs," p. 871.

† International Congress at Copenhagen.

Foxwell,* of Birmingham, considers it the best remedy for phthisis of which he has had any experience. He gives from 6 to 30 grains daily, and he gives the larger dose for three months continuously.

We have ourselves found iodoform of great service in many cases, but, given in pills, we have found it very badly tolerated by some patients, on account of the gastric irritation it has excited. In small doses, however, in combination with guaiacol and sweet almond oil, or mixed with cod-liver oil, we have found it well borne. We have found children take it exceedingly well mixed with cod-liver oil, in the proportion of ½ a grain to 2 drams of the oil, and we have found adults take it for long periods without any difficulty when given mixed with guaiacol and almond oil in capsules, which should be taken immediately after food, or if at other times, with a tumblerful of milk.

We have already shown in the chapter on *tubercular peritonitis* the great value of iodoform inunctions in that disease, and how rapidly it is absorbed (the B.P. ointment mixed with cod-liver oil) when rubbed into the abdominal surface.

It would seem probable that there is a real *antitoxic* action on the part of iodine to the tubercular infection, from the amount and variety of evidence that exists in its favour. Recently Dr. Flick† has expressed himself strongly on this point. He says, "By inunction with a solution of some of the rich iodine compounds I have increased my power to deal successfully with tuberculosis fully 50 per cent. over what it was before I began to use these drugs." *Europhen* dissolved in olive oil or cod-liver oil is the preparation he prefers.

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* *Birmingham Medical Review*, July, 1894.

† "Home Treatment of Tuberculosis." *Proceedings* of Philadelphia County Medical Society, February, 1901.

Elsewhere Dr. Flick remarks, "Of the drugs which tend to set up artificial immunity in tuberculosis the most valuable is undoubtedly *iodine.* The literature on tuberculosis, during the last half century at least, is dotted over with evidence of the curative powers of this drug."*

No other antiseptic has met with such general acceptance and approval in the treatment of phthisis as **creasote**, and now its derivative, **guaiacol**,† is largely used in its stead. It has been employed in the treatment of phthisis for many years, and may be regarded as a direct descendant of the old *tar* treatment, so much in vogue in the eighteenth century. It has steadily gained in favour, and is now perhaps more widely used than any other remedy for phthisis, notwithstanding the vast number of new remedies and new methods that have been of late so highly vaunted.

Professor Jaccoud, who is a warm advocate of the creasote treatment, believes—as we do—that creasote exerts a curative influence on the tubercular lesions in the lungs *by promoting sclerotic changes.* It diminishes the expectoration, lessens its purulency, and removes any fœtor it may possess; it reduces the extent of the catarrhal lesions, and so lessens considerably the area of the pulmonary changes. It lessens the tendency to hæmoptysis. It tends to clean the tongue, and promotes appetite and the capacity for taking food by its stimulating action on the stomach. But it does not agree with all patients. Some object greatly to its taste, and in some few cases it seems to set up gastric irritation. It has been given in many different forms; one of the most popular is in capsules, alone, or mixed with cod-liver oil. Capsules of 1, 2, or 3 minims may be given when the stomach contains food, or they may be washed down with a teacupful of milk, three or four times a day; or flexible capsules can be obtained, each containing a minim of creasote mixed with 5 or 10 minims of cod-liver oil. From five up to twenty such capsules may be taken in the course of the day, after food, or with a draught of milk. *Guaiacol* may be given in precisely the same way, and a quarter of a grain of iodoform may be introduced into each capsule; and the latter drug seems to be better tolerated in this form than in any other. Bouchard has pushed the dose of creasote to 40 minims (mixed with cod-liver oil) daily for several consecutive days. It is best to begin with a small dose, and increase it gradually. We have found the following a useful formula for those who do not object greatly to the taste of the drug:—

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* Hare's "System of Practical Therapeutics" (new edition), 1901, vol. i., p. 786.

† Creasote of the beech-tree contains 60 to 90 per cent. of guaiacol.

℞ Creasoti puri (*vel* guaiacol) ... ... ♏xlviij.
Glycerini puri ... ... ℥ij.
Tincturæ aurantii ... ... ad ℥iij.
Misce, fiat mistura.

One teaspoonful (2 minims of creasote) in a large wineglassful of milk and water, or in a little weak brandy and water, three or four times a day soon after food.

It has recently been urged that it is important to *saturate* the system with creasote, and it has been administered in many other ways than by inhalation and by the stomach. A mixture of creasote and cod-liver oil—1 dram of the former to 1 oz. of the latter—or guaiacol $2\frac{1}{2}$ drams mixed with $1\frac{1}{2}$ oz. lard, has been ordered to be rubbed into the armpits daily.

Lamplough,* at Victoria Park Hospital, has given creasote up to 120 to 240 minims daily in cod-liver oil, or in spirituous solution, giving small doses at first and then rapidly increasing the dose. He found the large doses were often attended by increase of appetite and diminution of cough, expectoration, and night sweats.

Flick† gives "pure beechwood creasote in hot water before meals in gradually increasing doses, until a maximum dose of 50 drops, three times a day, is reached," and if the patient bears it well, continues it indefinitely until all symptoms of pus-organism complications have subsided.

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* "Year-Book of Treatment," 1899.

† "Home Treatment of Tuberculosis," *Proceedings* of Philadelphia County Medical Society, February, 1901.

Prof. Anders[*] also commends the use of creasote. He does not exceed 15 to 20 drops three times a day, and when not well borne otherwise, he gives it by *enema*, mixing 20 to 30 drops with peptonised milk or white of egg.

Prof. Loomis[†] thinks it "a valuable remedy for the relief of the bronchial complications of tuberculosis," and we also think it probable that its good effects are partly due to its action on the pus-organisms which complicate the tuberculous infection in advanced cases.

The external use of guaiacol has been the subject of some interesting observations. When applied over the skin and covered with an impermeable covering, it is quickly absorbed, and in quantities of 30 to 60 minims causes a rapid and considerable reduction of temperature, with profuse sweatings. The temperature, however, soon rises again to the previous level, and this return of pyrexia is usually attended with rigors and much depression. At present the balance of evidence is unfavourable to this method of administering guaiacol, on account of the depression it produces.

It has been *injected into the lungs*—10 minims of a 3 per cent. solution in sweet almond oil—at the seat of the lesions (the apex), with an ordinary hypodermic syringe, most minute antiseptic precautions being taken. It has been injected subcutaneously: 5 to 10 drams of a mixture of 2 drams of creasote and 4 ozs. of almond oil have been injected into the lumbar region every second day.

Dr. Picot, of Bordeaux, has obtained excellent results from the hypodermic injection of guaiacol, 5 centigrammes, and iodoform, 1 centigramme, mixed with a cubic centimetre of sterilised olive oil and fluid vaseline.

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[*] "Text-Book of the Practice of Medicine" (fourth edition), 1900, p. 319.

[†] "Medical Annual," 1900.

He injects three cubic centimetres of this liquid into the subcutaneous tissue of the supra-spinous fossa daily. This is a large quantity to inject (45 minims), and we have found that a much more concentrated and smaller injection is quite as unirritating and quite as effectual. Iodoform ½ grain, and guaiacol 3 minims, mixed with 20 minims of sterilised almond or olive oil, for each injection, is a more convenient form. Others have used guaiacol and sterilised almond oil in equal parts, and, beginning by injecting 4 minims, have increased the dose up to 30 minims daily, and, in advanced cavity cases, with profuse secretion and expectoration, up to 60, and even 90, minims daily. But patients do not like these daily punctures, and as an alternative we have had capsules prepared, each containing ¼ grain of iodoform, 1½ minim of guaiacol, and 3 minims of cod-liver oil. One or two or more of those may be taken twice or thrice daily with a wineglassful of milk and water, after food.

We are convinced of the efficacy of creasote and its derivative, guaiacol, in arresting the progress of phthisis in many cases, and its efficacy is not limited to early cases; indeed, it seems to be of greater use in many chronic forms. It does not cure incurable cases, as some would seem to expect, but if properly, adequately, and carefully administered, it does as much in the way of remedying them as seems possible. How it acts it seems premature to determine. It is known that the bacillus of tubercle can with difficulty be cultivated in sterilised blood serum containing $\frac{1}{4000}$ its volume of creasote; and it seems possible that even in moderate doses it may render the lung tissues a less favourable culture medium for this microbe. Its usefulness in advanced cases is very probably dependent to some extent on its influence over the mixed infections which are then at work.

There is yet another method of administering creasote, a method introduced by Professor Germain

Sée. It is the combination of the inhalation of creasote vapour with compressed air. The patient is introduced into a compressed air cabinet containing fumigations of creasote and eucalyptus, and he has to remain there from three to six hours daily. This combination, according to Professor Sée, caused an "enormous absorption of creasote* by the whole pulmonary surface, diseased and sound." The beneficial effects appear to have been in some cases very remarkable. Dr. Tapret states that in six out of thirty cases submitted to this treatment the bacilli disappeared from the sputum.

Thiocal has been introduced as an improved preparation of guaiacol, but we are disposed to think that pure creasote is, after all, the best form. Renzi has stated that "guaiacol is more toxic than creasote, and not more efficacious."

Duotal (guaiacol carbonate) and *creasotal* (creasote carbonate) have been introduced as "free from the noxious by-effects of the plain creasote and guaiacol," but we have really no evidence that they are more serviceable in the treatment of phthisis.

A great number of other antiseptic agents—volatile and non-volatile—have been applied to the treatment of phthisis, and more or less success has been claimed for all of them. Some have had a brief popularity, and have then practically disappeared from use.

The inhalation of *turpentine* (or terebene) is of value in relieving the catarrhal conditions accompanying phthisis, and so diminishing cough and expectoration; it may be used alone or combined with carbolic acid, eucalyptol, chloroform, or camphor, in the inhalation-respirators already referred to. A small quantity (about 10 per cent.) of *chloroform* is often a valuable addition to many of these antiseptic inhalations. It is itself a powerful antiseptic, and by its ready volatility may help to convey the vapours of the other less volatile antiseptics deep into the air-passages, while its sedative effect is valuable in allaying irritative cough.

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* The air which is pumped into the cabinet to augment the pressure is passed through a mass of shavings saturated with creasote, and is made to take up 1 milligramme of creasote to each litre. During a *séance* of four hours it is calculated that the patient breathes on an average 1 dram of creasote.

Eucalyptol, like guaiacol, has been given hypodermically mixed with sterilised olive oil in the proportion of 1 to 4. Fifteen minims of this mixture are injected daily. It has been found to control septic and febrile conditions, and to diminish cough and expectoration.

Menthol mixed with olive oil (1 to 10) has been administered by *intratracheal* injection. The nozzle of the syringe is introduced between the vocal cords, and as much as a dram at a time of this mixture injected twice a day.

Byrom Bramwell, who has published some excellent results from this treatment, states that "after the first few injections the irritability of the throat and pharynx subsides, and the injection gives rise to no discomfort and to little or no cough," provided the operation be skilfully performed. It must be remembered that menthol is a powerful *anæsthetic* as well as an antiseptic.

Intratracheal injections of menthol and creasote combined have been employed on the Continent in phthisis with reported excellent results. The doses used have been large; as much as 30 minims of creasote, and 15 grains of menthol, mixed with 5 drams of sterilised oil, have been injected at one time. The patients have been said to support this treatment well, and to suffer no cough or other distress. Good results have also been reported from the continuous inhalation of oil of peppermint, together with the internal administration of the following :—

℞	Creasoti puri	♏xxiv.
	Glycerini puri	ʒiij.
	Olei menthæ piperitæ	♏x.
	Spiritus chloroformi	ad ℥jss.

Misce, fiat mistura.

A teaspoonful to be taken twice a day in a tablespoonful or two of syrup and water.

Myrtol, given in capsules, 2 grains in each, two every second hour, has been found by Eichhorst to influence favourably the course of pulmonary tuberculosis, especially when there is evidence of putrefactive processes in the air-passages.

Inhalation of ozonised oxygen has been commended by Ransome as attended by suppression of fever and night sweats, diminution of expectoration, improvement in appetite and sleep, and gain in weight.*

Professor Cervello, of *Palermo*, has introduced a method of treating phthisis for which he claims brilliant results. It consists in the inhalation, in a suitable apartment, of an atmosphere through which has been and is being diffused the vapour of a substance which he has termed *Igazolo*. It contains as its chief and most active constituent *formalin*—*i.e.* a solution of formic aldehyde, together with small amounts of iodine vapour. He states that he was led to select formic aldehyde because of its great volatility and diffusibility and its energetic disinfectant action. The difficulty, however, was the very irritating nature of its vapours locally when respired. He claims, by this method, to have overcome this difficulty. He employs a specially devised vaporiser—the "Salus Vaporiser." The patients are made to inhale this medicated atmosphere for two or three hours daily, and he considers that if employed in sanatoria the number of cures would be greatly increased. Out of twenty-six patients submitted to this treatment, he states that ten were "perfectly cured." The most curious and remarkable point in connection with this method is that Professor Cervello should conceal the exact composition of what he has oddly enough termed "Igazolo."†

Intrapulmonary injection of several of these antiseptic substances (creasote, a 3 per cent. solution in almond oil ; carbolic acid, a 2 per cent. solution in glycerine; iodoform in olive oil; iodine in weak solution; mercuric chloride in weak dilution; iodine and carbolic acid combined; camphor and carbolic acid combined; camphorated naphthol) has been practised by many physicians, but serious accidents have occasionally attended this method of treatment, and the benefits resulting from it have not been sufficiently great or lasting to recommend it for general adoption.

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* *Medical Chronicle*, vol. viii., p. 37, and vol. x., p. 97.

† Suppl. al *Policlinico*, April 7th, 1900.

Intravenous injection of Hetol or **Sodium Cinnamate** in the treatment of phthisis has been enthusiastically advocated by Professor Landerer,* of Stuttgart, and carried out by him in his sanatorium for tuberculosis at Krähenbad, in the Black Forest. Its use has also been long and carefully examined by Professor Ewald, of Berlin, and by others. The method employed is that of intravenous injection, usually into the cephalic or median vein at the bend of the elbow. The most elaborate antiseptic and other precautions have to be observed. Injections into the gluteal region have also been employed. Its mode of action is said to be (1) that it establishes a general leucocytosis, (2) that it causes an aseptic influx round the tuberculous centres, which leads to encapsulation and infiltration of the tubercle, first by leucocytes, then by young connective tissue and vessels; a connective tissue-like capsule is formed, within which the caseous masses are absorbed, and finally interstitial pneumonia and cicatricial shrinking takes place.

These changes are regarded as precisely similar to those observed in the spontaneous cure of tuberculosis, *but more active and energetic.* The bacilli ultimately disappear. Small doses should be used at first, viz. 1 milligramme of a 1 per cent. solution, increasing by ½ to 1 mg. from time to time. The injections are given every other day. The average dose for males is 15 to 20 mg., for women and girls

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* Landerer: "The Treatment of Tuberculosis by Cinnamic Acid." F. C. W. Vogel, Leipzig, 1898.

10 to 15 mg. After a time the 1 per cent. solution is changed for a 5 per cent. solution. The treatment is continued until the bacilli disappear from the sputum—*i.e.* about three months.

One of the drawbacks to the use of *hetol* is that it causes a tendency to attacks of hæmoptysis, and its employment has occasionally had to be suspended for this reason.

Other physicians have obtained some favourable results from this treatment, but not at all in the same proportion as Professor Landerer, and it has been suggested that the results published by him have been largely attributable to the combination of sanatorium treatment with that by hetol.

Professor Ewald applied this treatment to twenty-five selected cases, which offered favourable conditions for its success, and persevered with it for long periods—for 150, 221, and even 316 days. His results were not particularly good. Only three cases showed more marked improvement than is usually obtained from ordinary hygienic treatment, fourteen improved, ten were not benefited, and seven of them died. Ewald thought the treatment merited further trial, although some of his patients complained of great weariness and somnolence while under this treatment.

Guttman * also has examined fully the effects of hetol treatment in tuberculosis. He put it to a severe test, and his results were not particularly good. He is, however, inclined to think favourably of the method, and advises others to try it.

The method of *intravenous* injection is also that adopted by Dr. R. Maguire in the use of **formalin** in the treatment of phthisis. His idea is to effect a "sluicing of the lung" by as strong a solution of formic-aldehyde as possible. The method, as is admitted by Dr. Maguire, is not without risks, and the technique, as practised and advocated by him, is delicate and difficult. Some experiments on himself

* *Berl. Klin. Woch.*, July 8th, 1901.

by this method were followed by albuminuria, copious hæmaturia, and thrombosis of a vein in the arm.*

It must also be borne in mind that when a substance like formic-aldehyde is thrown into a vein, although it mixes first with the blood in the right side of the heart and passes thence to the lungs, it very shortly reaches the left side of the heart, and circulates through all the tissues; and we have to consider what secondary effects it may have on these.

We own to a dislike to *intravenous* administration of drugs, unless in desperate cases, when no other reliable means are available.

Dr. Maguire asserts that the administration of formalin by the respiratory passages is useless; but this is reprehensible dogmatism, for there exists the same kind of testimony, as to its value, in this form, as he advances in favour of his method.

Dr. Ewart has injected *protargol* into the veins for the same purpose. He employed 40 c.c. of saline solution, containing from 1½ to 2½ grains of protargol.

Twelve to fifteen injections were given daily or on alternate days. We understand that rigors occasionally followed these injections.

We should advise great caution in the adoption of such measures, and we should wait patiently for further evidence of their harmlessness and utility.

Tuberculin.—This substance, introduced by R. Koch, as a specific and secret remedy for phthisis, in the autumn of 1890, was soon announced to be a glycerine extract of the products of the cultivation of tubercle bacilli. It was stated by Koch that it acted in a specific manner on tubercle, exerting a selective action upon it, hastening its disintegration, and under appropriate conditions led to the cure of phthisis. The excitement throughout the medical world at this announcement was intense, and the scenes in Berlin which followed, and which we had the opportunity of contemplating, were perhaps the most remarkable in the history of medical science. This is not the place to write the history of that extraordinary and unfortunate announcement. Those who saw, as we did, the severe reactions which followed, in many cases, the subcutaneous injections of tuberculin, felt that there must be serious risks attending its general use, and that, like most other remedies for phthisis, it could only cure in *curable*—that is, in carefully selected—cases. But it soon became clear that a reprehensible haste had been manifested in the promulgation of the conclusions to which Koch had been prematurely led. The cardinal point in his preliminary statement was that guinea-pigs could be rendered immune to inoculated tubercle by this substance; but even this assertion has been seriously called in question by other observers. It was not long before a sense of profound disappointment succeeded to the enthusiasm excited by the exaggerated statements that had been promulgated; this change of feeling was started by the reports of Virchow and others, supported by many pathological facts, that treatment by tuberculin was attended by serious risks of dissemination of the tuberculous virus throughout the body, by the softening and disintegration of quiescent deposits, roused into activity by the severe inflammatory action excited around them. Much discussion followed, and the final result was that the remedial action of tuberculin, not only in phthisis, but in tuberculous diseases generally, became discredited, and its use almost universally abandoned.

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* Harveian Lectures, *British Medical Journal*, December 15th, 1900, p. 1697.

We must not, however, withhold our own testimony to the fact that in certain carefully selected cases of phthisis, and with a very careful use of tuberculin in minute doses, we obtained some excellent results; and if we relinquished its use, it was in deference to the alarm and distrust of the remedy aroused by its antagonists in the minds of the profession and the public; for, hastily and prematurely advocated, it was hastily and almost angrily denounced.

Since this period a **new** tuberculin (T. R.) has been introduced by Koch, derived from human tuberculosis; it is doubtless a much milder preparation. Its advocates maintain that it is of great value in suitably selected cases if too large doses are avoided. Also it must not be given until the temperature has been normal for at least twenty-four hours, and the dose should always be diminished if its use is followed by rise of temperature. It must also be avoided in *mixed* infections, *i.e.* in all advanced cases, for in such cases it is worse than useless.

Koch * has stated that in persons prone to febrile reaction the first dose should not be more than $\frac{1}{10}$ milligramme, and that no further injection should be given until the temperature is again normal. He maintains that a complete cure frequently follows its use in early uncomplicated cases. The treatment must, however, be extended over a considerable period, with intervals of three or four months, until the injections give no reactions. It is essential that the patient should be in bed during its use.

It is clear that the use of tuberculin must have a very limited application, owing to the difficulty of finding suitable cases, as we have to exclude all cases with rise of temperature and all mixed infections.

Its chief and generally recognised value is as a *diagnostic* agent in the earliest stage, before an examination of sputum can be made, and when the nature of the case is doubtful. It then enables us to ascertain the important fact whether the case is, or is not, tuberculous! Its mode of application is as follows: The patient's average temperature is determined by observations extending over several days. A dose of $\frac{1}{2}$ or 1 milligramme of the old tuberculin is then injected. If this is followed by a rise of temperature up to 2° F., the evidence is regarded as positive.

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* London Congress on Tuberculosis, *British Medical Journal*, July 27th, 1901.

If no rise of temperature occurs, then, after an interval of three days, a second injection of twice the dose is given, and if no rise of temperature again occurs, after another wait of four or five days a still larger dose (4 or 5 milligrammes) is given. If a positive reaction is probable it generally occurs after the first and smaller dose.

An attempt to produce an **antitoxic serum** wherewith to treat tuberculosis has been made by Maragliano. It is obtained by treating horses with tuberculin and then with virulent cultures of the tubercle bacillus.

No very definite good results have been reported from its use. There is the usual amount of conflicting testimony—some reporting favourable effects on the progress of the disease, while others have not been able to distinguish either good or evil effect.

The advocacy of **nuclein** and **nucleinic acid** in tuberculosis comes to us from America. These substances are derived from yeast, and their use is founded on the idea "that the soil for the tubercle bacillus can be destroyed by introduction into the blood and tissues of certain products of fermentation obtained from animal life and plant life in other departments of nature."* The dose is 60 to 80 minims of a 1 per cent. solution of nucleinic acid daily by hypodermic injection. Flick observes that this treatment has not yet been fully developed, but that a large percentage of recoveries have been reported. It should be used in the early stages of the disease. Maguire experimented with a solution of nucleinate of soda, and obtained a certain amount of improvement in the general condition, but also a marked febrile reaction.

The **alkaline hypophosphites** are of considerable value in a certain number of cases of phthisis. In advanced cases, with both lungs involved, they *can only* act as general tonic remedies, and this they will do in certain instances when there is no great amount of general cachexia. In acute febrile cases running a rapid course they are useless. They will often be found of great, though temporary, benefit to fair, florid *young* persons who are the subjects of chronic phthisis. They are of much less use to old than to young people; but to young children, in almost all forms of chronic lung disease, they prove of the greatest service; and especially in the chronic bronchial catarrhs of scrofulous children.

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* L. F. Flick, in "Hare's System of Practical Therapeutics" (new edition), 1901; vol. i., p. 784.

In the cases in which they do good their beneficial effect is generally noticed almost immediately. Patients usually say they feel very much better "in themselves," they feel stronger, in better spirits, are more active, eat better, and sleep better. The night sweats disappear, the cough sometimes disappears also. But, notwithstanding the evident improvement in general health, the physical signs often remain the same, and the amelioration which follows the use of the hypophosphites is, in many cases, only of temporary duration.

The hypophosphite of lime is the preparation we have found most useful After giving it in various forms and doses, we find the following formula the best:—

℞ Calcis hypophosphitis	gr. iij.
Glycerini	♏xx.
Tincturæ quassiæ	♏x.
Syrupi aurantii	ʒss.
Aquæ	ad ℥ss.

Misce, fiat dosis. To be taken three times a day, an hour after food.

For young growing children a combination of the hypophosphite of lime and the syrup of the phosphate of iron acts much better than the lime salt alone.

The following formula is calculated for children from eight to ten years of age:—

℞ Calcis hypophosphitis	gr. jss.
Syrupi ferri phosphatis	āā ʒss.
Syrupi simplicis	
Aquæ destillatæ	ad ʒij.

Misce, fiat dosis. Three times a day after meals.

Arsenic, as a remedy for phthisis, has been greatly extolled, especially by French physicians. Jaccoud says "it is *infallible* in its restorative effects" if long persevered in, and that it leads to retrocession of the local lesions. He gives 1 milligramme (about $\frac{1}{60}$ grain) of arsenious acid in pilules (*well prepared and readily soluble*) twice a day at the commencement of a meal, and increases the dose gradually up to 1 centigramme daily; he continues this dose until signs of intolerance show themselves, the chief of which are great feebleness of the lower extremities and great lassitude after walking. He then considerably reduces the dose, and again slowly increases it. Moutard-Martin thinks it most useful in the *torpid* form of phthisis. He has observed both local and general amelioration follow its use. Hérard and Cornil complain that *arsenic* does not occupy the rank it merits in therapeutics; they think it has both a local and general good effect in pulmonary tuberculosis: they consider it lessens congestion by its influence on the ganglionic nervous system, and so remedies the hyperæmia and inflammations which develop around tuberculous granulations.

Fonssagrives approves of arsenic in the form of arsenate of soda, of which he gives $\frac{1}{26}$th of a grain in a tablespoonful of water twice or thrice daily.

Dujardin-Beaumetz wrote: "I am one of the warmest partisans of the arsenical treatment, and I have myself seen some marvellous results from it."

We see here a remarkable unanimity on the part of French physicians as to the value of arsenic in phthisis.

Ringer considers he has seen children "with severe tuberculosis, involving lungs, intestines, and peritoneum, steadily and slowly improve, and ultimately recover under arsenic"; and he has seen "a like result in adults in phthisis in the subacute and chronic forms." Bartholow considers "we have no single drug of equal utility in the chronic forms of phthisis," but it is useless in cases with "much hectic and rapid degeneration of the pulmonary tissues."

We have not ourselves observed any such brilliant results from *arsenic*, but it is always worth a trial, especially in chronic cases with accompanying bronchial catarrh. We have not found it of any great value in the more acute forms, nor in those in which there is a very decided hereditary predisposition, nor in others with a tendency to gastro-intestinal catarrh ; but we have found it useful in some chronic forms, and especially in those which appear to have had their starting-point in catarrhal and congestive attacks of one apex with pleuritic adhesions, often coinciding with rheumatic tendencies. Given in combination with alkalies (as in the Bourboule water), we have found it beneficial in relieving the catarrhal symptoms and improving the general health.

Most extraordinary claims have been recently advanced by Professor Armand Gautier, of Paris, on behalf of **cacodylate of sodium** in the treatment of phthisis. It is maintained that arsenic in this form can be taken, in very much larger doses, with advantage and impunity, than in the usual preparations. Beginning with 2 centigrammes, and gradually increasing this dose, as much as 10 centigrammes have been given daily by hypodermic injection, without producing, it is stated, any untoward effect.

Statements have been put forth in the public Press of the most exaggerated nature as to the success that has attended this mode of treatment, but we have, so far, failed to obtain any trustworthy confirmation of these reports.

As to the value of **iron** in the treatment of phthisis, many differences of opinion have existed, but there is a general agreement that it must not be given where a tendency to hæmoptysis exists. In such patients the cardio-vascular system is often very excitable, and the administration of iron, by stimulating the cardiac irritability, may be the means of inducing that hæmorrhage which it is one of our main objects to avoid. But in some of the subjects of chronic phthisis, especially in poor, anæmic, and underfed patients, the value of an iron tonic is remarkable, and it may be given, with advantage, for long periods at a time.

A good form for this class of patients is the following:—

℞	Liquoris ferri perchloridi	♏ xxiv
	Spiritus chloroformi	♏ x.
	Infusi quassiæ (1 %)	ad ℥j.

℥ss vel ℥j pro dose.

The stronger preparations of iron are not, however, well borne by the better-fed and more delicately nurtured subjects of phthisis, nor is it suitable to febrile or dyspeptic cases. It is in the torpid, chronic forms of phthisis, attended with profuse expectoration from co-existing bronchial catarrh, that the above mixture is so useful.

A good form in which to administer iron to phthisical children and young adults is the well-known compound syrup of the hypophosphites; a teaspoonful twice a day an hour after food.

For scrofulous young people the syrup of the iodide of iron is the best form to prescribe, in half a teaspoonful or teaspoonful doses, after food, twice or thrice a day.

Cod-liver oil is a valuable remedy for phthisis under certain conditions. It is especially useful in the treatment of the poor and ill-fed; it supplies the place of food in such cases. It is not, however, so much the practice now, as it once was, to order *all* phthisical patients to take this oil as an essential and indispensable part of their treatment, as it is certainly possible to find other means of maintaining and augmenting the nutrition of the body. Most English physicians also give it in smaller doses than they used to—two teaspoonfuls twice a day is now an average dose. It is always a favourable point in the case if the patient takes the oil willingly, and digests it easily,

BOSTON MEDICAL JAN 22

for this indicates a satisfactory state of the organs of digestion and the absence of fever. Cod-liver oil is ill borne, and therefore of little use, in cases of febrile phthisis. The absence of fever and the quiescence of the local affection favour its digestion and absorption. On the other hand, gastric debility or the existence of gastric or intestinal catarrh, so common in the more active forms of phthisis, and sometimes associated with the chronic form, counter-indicates the use of the oil, or calls for its suspension. As a good *general* rule, we should prescribe cod-liver oil in all cases in which it is certainly well borne and easily digested, and we should withhold it in all cases in which it is ill borne and digested with difficulty. In children and young people, especially if they present signs of the scrofulous constitution, we should urge its use, and not allow it to be hastily set aside. Where it agrees well its good effects are soon manifested in increase of appetite, improved vigour, greater capacity for exertion, and increase in body-weight.

As a prophylactic, its regular use in small quantities should be urgently recommended for all young, delicate, and scrofulous children. If its use is begun when the children are very young, we rarely find any objection made to its taste in after-years, so that a tolerance of the remedy is early established.

The difficulty which some patients experience in taking the oil has led to many practical suggestions as to the best mode of giving it so as to overcome the repugnance felt to it.

A great number of emulsions of cod-liver oil and mixtures with malt extract are now prepared, and many of them are well made, and more easily digested by some patients than the pure oil.

Glycerine has been regarded by some physicians, and especially by Jaccoud, as a good substitute for cod-liver oil when the latter cannot be taken. Jaccoud maintains—and he is supported by Germain Sée in the statement—that glycerine acts as an important aid to nutrition, promoting assimilation and lessening waste (increasing the amount of carbonic acid expired, and lessening the amount of urea excreted), and so causing a gain in body-weight during its use. As glycerine is an alcohol, and, like other alcohols, capable, when taken in excess, of producing intoxication, it is necessary to regulate carefully the dose. Jaccoud gives from 10 to 15 drams per diem; he has found the larger dose occasionally cause an elevation of temperature, and then he has fallen back on the smaller dose. He is accustomed to add two teaspoonfuls of rum or brandy and a drop of essence of peppermint to each dose, simply to give it an agreeable taste. He states that he finds distinct advantage in giving this to all his phthisical patients who cannot take, or who are tired of taking, cod-liver oil.

The use of mineral waters.—The treatment of phthisis is undertaken at many Continental spas, and, although the evidence at our command on this subject is unusually conflicting, we cannot pass over in silence methods of treatment which have so many advocates.

The following comprise the chief spas which have been recommended for the treatment of phthisis:—

1. *Sulphur springs*, as Eaux Bonnes, Cauterets, St. Honoré, etc.
2. The *alkaline bicarbonate* of soda waters—most of them containing also small quantities of chloride of sodium—as Ems, Salzbrunn, Neuenahr, Gleichenberg.
3. The *arsenical* waters, as La Bourboule, Mont Dore, Royat. These also contain bicarbonate of soda and chloride of sodium, like the second group.
4. *Saline, or common salt waters*, as Soden, Reichenhall, Salzungen, Kreuznach.
5. *Sulphur and salt combined*, as Uriage, Aix-la-Chapelle, etc.
6. *Lime waters*, as Weissenberg and *Lippspringe.*

The *alkaline bicarbonate of soda waters* are chiefly useful in the treatment of the chronic bronchial catarrh of phthisical patients who are free from fever.

Ems, which was at one time regarded as a suitable resort for such cases, is now universally prohibited in phthisis on account of its situation and climate.

Salzbrunn, in Silesia, 1,220 feet above the sea, and sometimes termed the "cold Ems," is better situated, and forms an appropriate summer resort for cases of old stationary phthisis, associated with catarrhal and dyspeptic symptoms.

Gleichenberg, in Styria, has also a very mild climate and a moist atmosphere, and the same kind of water as Ems, only more strongly mineralised. Inhalations are practised there, and the place is well adapted to the cases indicated above.

The "*sool*" or *common salt waters*, and the inhalation of the salt-impregnated atmosphere which surrounds the graduation works commonly found at these spas, or of the pulverised saline water in their inhalation-chambers, are useful in the treatment of the chronic bronchial catarrh which accompanies most cases of chronic phthisis. The saline solutions appear to produce a stimulating effect on the bronchial nerves, "causing vigorous contraction of the muscles, and thus promoting expectoration," while the water inhaled "softens the secretions and the epithelium."

The cases which derive the greatest benefit from such establishments as the Reichenhall Inhalatorium, in which the air is strongly charged with saline spray, are "old bronchial catarrhs, bronchial dilatations, and stationary cavities, with abundant secretion."

Sulphur waters have always enjoyed a great reputation in France in the treatment of phthisis, and they appear to have proved of service in suitable cases. The warm springs of Eaux Bonnes, Cauterets, St. Honoré, Amélie, etc., are the most in repute.

In all these spas it is usual to drink a small quantity of the water at first, only 1 or 2 ounces, which is increased when well borne by the patient to two or three glasses a day. In some there are inhalation-chambers filled with the pulverised water, or with gaseous sulphuretted hydrogen, separated from the water by mechanical means, and in these the patients remain for a certain time. Baths, half-baths, foot-baths, and hot douches to the lower extremities are applied in most of these resorts.

The effect of these sulphur waters is considered to be in a special manner *anti-catarrhal.* They both promote expectoration and diminish its quantity. They are considered also to possess anti-scrofulous and anti-lymphatic properties, to act as tonics to the skin (when taken as baths), and to remove that excessive impressionability of the surface so common with the phthisical, and so to protect them from their tendency to bronchial catarrh. And, ultimately, they are believed to have a general stimulating and tonic effect. With some persons they set up digestive troubles and loss of appetite; therefore the stronger waters should always be diluted, either with milk or a little syrup and water.

The sulphur cure is especially suited to cases of phthisis in scrofulous or lymphatic persons: the form that has been termed "torpid phthisis." The general health should not be gravely compromised; there should be an absence of fever; slight febrile excitement is not, however, a counter-indication; but there should be no tendency to congestion or hæmoptysis.

Spas, such as *Uriage*, *Allevard*, etc., whose waters contain chloride of sodium, as well as sulphur compounds, are especially suited to the treatment of those scrofulous forms of phthisis associated with swelling and suppuration of lymphatic glands.

Of the *arsenical springs*, such as Mont Dore, Royat, and La Bourboule, it is only in the last that arsenic exists in quantity sufficient to induce the belief that this constituent plays an essential part in the effects produced. The Royat and Mont Dore waters are warm weak alkaline springs containing a small quantity of chloride of sodium; indeed, Royat has been called "the French Ems."

The good results reported to have been obtained in the treatment of certain cases of phthisis at Mont Dore are, probably, referrible, as at other spas where the inhalation of an atmosphere saturated with vapour of water is an essential part of the treatment, to the influence of the methods employed there on the catarrhal affection, on the secretions and inflammatory exudations which are retained in the air-passages; and it is highly probable that many of these cases have not been truly cases of tubercular phthisis, but chronic catarrhal and congestive conditions of one or other apex, together with apical pleuritic adhesions—a pathological condition not uncommonly encountered as a result of acute catarrhal attacks in rheumatic subjects. Cases of chronic phthisis in the fairly robust, complicated with a tendency to asthma, are those best suited to the Mont Dore cure.

La Bourboule has been found very useful in the treatment of enlargement of the bronchial glands in strumous children.

ADDITIONAL FORMULÆ.

Arsenic and iron drops in phthisis.

℞ Liquoris arsenicalis, ʒj.
Tincturæ ferri malatæ, ʒv.
Glycerini, ʒv.
M. Fifteen drops twice a day after meals. (*Schnitzler.*)

Creasote mixture.

℞ Creasoti puri (Morson's), ʒss.
Spiritus cinnamomi, ʒiv.
Tincturæ aurantii, ℥ijss.
Glycerini ad ℥iv.
M. f. mist. A teaspoonful in a little water three times a day after food. (*Whitla.*)

Another.

Beechwood creasote, 32 to 80 minims.
Glycerine, 2 to 4 oz.
Tincture of cardamoms, 2 to 4 drams.
Alcohol, 4 to 8 oz.
Mix. Two to four teaspoonfuls in three or more ounces of water three to five times a day after food. (*S. Solis Cohen.*)

Inhalation in phthisis.

℞ Iodoformi, gr. xxiv.
Creasoti puri, ♏iv.
Olei eucalypti, ♏viij.
Chloroformi, ♏xlviij.
Alcohol. et ætheris q.s. ad ʒiv.
M. f. inhal. (*Robinson.*)

Mixture for phthisis.

Oil of gaultheria, 2 minims.
Creasote, 5 minims.
Donovan's solution, 5 minims.
Cod-liver oil, 2 drams.
Acaciæ } a sufficiency.
Sugar }
Water to make an emulsion of half an ounce.

Mix. After meals three times a day. (*S. Solis Cohen.*)

Tannin wine for phthisis.

Tannic acid, 80 grains.
Glycerine, 1 oz.
Wine, 1 quart.

A claret-glassful after each meal.
(*Raymond and Arthanv.*)

Biniodide of mercury spray for inhalation.

℞ Hydrargyri biniodidi, gr. vijss.
Tincturæ opii, ʒjss.
Aquæ destillatæ, ℥xxx.
M. To be used as a spray.
(*Miquel.*)

Antiseptic hypodermic injection.

℞ Acidi carbolici, partes v.
Eucalyptol, partes v.
Iodoformi, partem j.
Vaselini (liquidi) ad partes c.
M. (*Meunier.*)

Iodoform and creasote pills.

℞ Iodoformi }
Creasoti } āā gr. ¼
Pulveris benzoini }
Pulveris balsami tolutani }

To be made into a pill and coated with sugar. Two to four daily. (*Huchard.*)

CHAPTER V.

SYMPTOMATIC TREATMENT OF PHTHISIS.

Counter-irritation—Flying Blisters—Iodine—Paquelin's Cautery. *Treatment of Fever*—Quinine—Digitalis—Salicylic Acid and Sodium Salicylate — Antipyrin — Phenacetin. *Treatment of Night Sweats*—Different Forms of Sweating—Hypophosphite of Lime — Quinine — Digitalis—Arsenic — Cold Sponging — Zinc Oxide—Gallic and Tannic Acids—Sulphuric Acid—Perchloride of Iron with Strychnine—Dover's Powder—Belladonna —Atropine — Picrotoxine — Agaricine —Pilocarpine — Sulphonal—Camphoric Acid—Tellurate of Sodium—Ergot—Sponging with Weak Belladonna Solution. *Treatment of Cough*—Forms of Cough—Need for Caution in the Use of Opiates—Alkaline Drinks to Promote Expectoration—Inhalations, Balsamic and Sedative—Counter-irritation—Sedative Syrups, etc. etc. *Treatment of Vomiting* — Explanation of its Causation—Management with regard to Food, etc. *Treatment of Hæmoptysis*—Tendency to Spontaneous Arrest—Different Forms—General Management—Ergot and Ergotine —Gallic Acid — Hamamelis — Turpentine — Sulphuric Acid with Aperient Sulphates—Perchloride of Iron — Digitalis—Acetate of Lead—Common Salt — Ipecacuanha — Local Application of Cold—Opium and Morphine—Aperients—Blood-letting—Blistering—Alcohol— Prophylactic Measures. *Treatment of Disorders of Digestion*—Loss of Appetite—Dyspepsia — Pyrosis — Constipation — Gastralgia — Diarrhœa. Additional Formulæ.

ONE of the most efficient means we possess for relieving the *symptoms dependent on the pulmonary congestion and inflammation* which so constantly accompany pulmonary tuberculosis is **counter-irritation.** It is often attended by manifest relief of cough, diminution of fever, and marked improvement in the local physical signs.

The best mode of counter-irritation is the repeated application of flying blisters. Two or three small blisters, about the size of a penny-piece, are placed over the area of dulness, or the affected portion of lung; they are applied in succession over different but contiguous spots, and retained from two to four or five hours, according to the delicacy of the skin; redness of the skin rather than vesication being aimed at, so that the blistering may be frequently renewed over the same spots. In this way a small blister may be moved, from spot to spot, over, for instance, the supra- and infra-clavicular regions in front, and over the supraspinous and interscapular regions behind. When the whole of the desired surface has been blistered, a few days' rest may be allowed until the skin is again in a condition to bear a renewal of the counter-irritation. Subsequently the counter-irritation may be kept up by the application of iodine. For this purpose it is best to use a mixture of equal quantities of the *tinctura* and the *liquor iodi fortis* of the B.P. The former is too weak and the latter too strong to be used separately. It is advisable to avoid painting each day the *same* area; it is best to choose one area one day, another the next, and so on.

A very favourite method of applying counter-irritation in France is the rapid application of the actual cautery, in the form of a white-hot pointed cone of metal; that invented by Paquelin, and called Paquelin's cautery, is usually employed. By its means a number of small pointed cauterisations can be rapidly made and frequently renewed. It has the advantage of being clean, rapid, and almost painless. It is usual to make about twenty to thirty of these cauterisations, under one or both clavicles, every five days. We greatly prefer these methods to croton oil liniments, or tartarised antimony ointment.

Fever is one of the most important symptoms we are called upon to treat in the progress of a case of phthisis, as it is almost certain to be present in some part, if not in the whole of its course. So long as the fever remains uncontrolled, we know that the "*consumption*"—*i.e.* the exhaustion of the patient's strength and the wasting of his substance—must go on. Indeed, we rightly test most of our remedies for phthisis by the thermometer. All those remedies which have been described under the head of "general" remedies, when they succeed in influencing favourably the progress of the disease, have the effect of lowering the febrile temperature. In so far as the fever may be dependent on congestion or inflammation of the surrounding lung tissues, counter-irritation in relieving or modifying these conditions will also have the effect of lowering the temperature.

But, besides these general and local remedies, there are others which have been specially used on account of their influence, more or less direct, over the febrile process.

Quinine and *digitalis*, together or singly, have been largely used as antipyretics in phthisis. We have ourselves employed them very extensively in the treatment of phthisis, and have often found them of real value. One drawback to their use, however, is that in certain patients they produce some gastro-intestinal irritation; this is more frequently the case when digitalis is given in the form of powder.

Niemeyer speaks very favourably of the combination of quinine and digitalis in the fever of phthisis, especially when it assumes a somewhat periodic form, with marked evening exacerbations ushered in by chills.

The advantage of using quinine as an antipyretic, in comparison with other proposed remedies, is that it acts as a general tonic, and while it checks the fever, it also, in small doses, improves the appetite.

We have found the following combination improve appetite, increase strength, and keep down the fever and night sweats:—

℞ Quininæ hydrochloridi	gr. ij.
Calcis hypophosphitis	gr. iv.
Tincturæ nucis vomicæ	♏xxv.
Tincturæ aurantii	ʒss.
Glycerini	ʒj.
Aquæ	ad ℥j.

Misce, fiat dosis. To be taken half an hour before meals three times a day.

Another remedy for the fever of phthisis which has found many advocates is *salicylic acid* or *sodium* *salicylate.* We do not think them so useful as quinine, and they have the disadvantage of being depressing; it is, however, possible that they may exert an antiseptic effect in advanced cavity cases, with mixed infection, associated with the presence in the lungs of pyogenic organisms.

Antipyrin has been largely used to reduce the temperature in febrile forms of phthisis; but nervous depression, vomiting, occasional profuse sweatings, great lowering of cardiac power, are effects of its use that have been recorded by many different physicians.

As an adjunct to our means of controlling rises of temperature in phthisis, a few small doses of antipyrin may be certainly of value, but we must watch carefully its effect both on the patient and on the temperature.

We greatly prefer *phenacetin* in small doses—2 or 3 grains—in combination with hydrobromide of quinine—2 to 4 grains—three times a day; this combination we have found useful in reducing temperature in phthisis, without causing any appreciable depression.

Closely connected with the fever of phthisis are the **nocturnal perspirations.**

These may be arrested or diminished by a variety of means. The appropriateness of the remedy will depend on whether the nocturnal perspiration is the termination of a crisis of hectic fever, or whether it is simply the result of exhaustion, or a consequence of a special condition of the skin common in phthisical patients. Those who regard these perspirations as exclusively symptomatic of fever should bear in mind that in certain persons profuse perspirations are produced by causes quite independent of fever, and associated apparently with a peculiar condition of the skin; that it is not an uncommon symptom during convalescence from any acute exhausting disease, especially influenza, as well as in all states of general debility. Moreover, sleep itself appears to have a curious direct influence in the production of these perspirations in many cases, as they will often occur during the daytime if a phthisical patient falls asleep. Then again, the sweatings at night are often associated with violent fits of coughing, and would seem to be induced by them, the muscular efforts associated with protracted fits of coughing in these debilitated subjects giving rise to profuse perspiration.

If, therefore, we are careful to bear in mind that the nocturnal perspirations of phthisis may depend either on the hectic fever, or on a peculiar condition of the skin, or on simple debility, or finally on the exhausting effects of severe paroxysms of cough, or on a combination of two or more of these factors, we shall be able to understand how it happens that different remedies succeed in checking these perspirations in different patients.

When, as in many cases, the sweatings are found to come on regularly at a certain fixed hour of the night, generally from 2 to 4 a.m., it is pretty safe to regard them as connected with the daily febrile paroxysms. If, however, the patient states that *whenever* he wakes up from sleep at any time, day or night, he finds himself bathed in perspiration, it must be looked upon as dependent on exhaustion or associated with a peculiar condition of skin. Remedies, therefore, directed to the improvement of the general constitutional state, to the relief of the exhaustion, and the promotion of nutrition, will often prove more effectual than any other means in arresting these perspirations. We and others have noticed that the administration of the hypophosphite of lime in the manner already directed leads to the cessation of the nocturnal perspirations in some patients in from ten days to three weeks; and this may be regarded as a test of the suitability of the remedy. If, after the use of the hypophosphite for three or four weeks, we find it has no influence over the night sweats, we usually set it aside as of little or no value in that particular case.

When the evening temperature is high (the rise of temperature frequently commences early in the afternoon), from 102° to 103·5°, and the night sweats appear to be undoubtedly febrile, as we have already said, quinine or a combination of quinine and digitalis proves a valuable remedy. The quinine, however, should not be given near bed-time, as it often provokes sleeplessness, and aggravates the night cough; and digitalis, if given for long periods at a time, is very apt to cause gastric disturbance. Another drawback to the use of quinine is that it very frequently excites headache in phthisical patients. It is, however, a valuable remedy in treating the pyrexia, and the associated night sweats, in a large number of cases of phthisis.

The two following are useful forms for the administration of quinine and digitalis:—

℞	Quininæ hydrochloridi	gr. iij.
	Acidi hydrochlorici diluti	♏v.
	Tincturæ digitalis	♏xii.
	Spiritus chloroformi	♏x.
	Aquæ cinnamomi	ad ℥j.

Misce, fiat dosis. To be taken twice a day (about 12 and 6) an hour before meals.

Or ℞	Quininæ sulphatis	gr. iij.
	Pulveris digitalis	gr. ss.
	Extracti lupuli	quantum sufficiat

Ut fiat pilula. To be taken twice a day at the same hours.

To patients who do not bear quinine well, arsenic may be given: arsenious acid $\frac{1}{60}$ grain, or arseniate of iron $\frac{1}{12}$ grain in a pill, three times a day, may be prescribed. When the perspirations appear to depend upon exhaustion, light food with some alcohol taken at bed-time, or about 2 or 3 a.m., such as a breakfast-cupful of arrowroot or beef-tea, or milk, with a table-spoonful of brandy or whisky, will often greatly diminish this tendency.

We have often proved the efficacy of sponging the whole of the body, or only the chest and back, at bed-time with cold water, to which a little vinegar and eau-de-cologne have been added; or a lotion may be prescribed as follows:—

℞ Spiritus vini rectificati ... ... ℥ij.
Acidi acetici diluti ... ... ʒjss.
Aquæ floris aurantii ... ... ℥xijss.
Misce, fiat lotio.

This may be further cooled when used by the addition of a little ice.

Of the various *astringent* remedies that have been recommended for the relief of the night sweats of phthisis, none is so deservedly popular as *zinc oxide*. It may be given by itself in the form of pills, in 5- or 10-grain doses, at bed-time; or it may be advantageously combined with extract of henbane, which appears to promote its action.

Gallic and tannic acids have also been recommended in doses from 3 to 10 grains.

The aromatic sulphuric acid in 15- or 20-minim doses, in cinnamon water, at bed-time, is a useful remedy in slight cases; and in more troublesome ones a combination of this remedy with gallic acid has been found useful.

In chronic cases the perchloride of iron in 15- to 20-minim doses thrice daily is valuable for its astringent as well as its general tonic effect, and the addition of 3 to 5 minims of liquor strychninæ increases its usefulness. The dilute phosphoric acid has also had its advocates. It should be given in 15- or 20-minim doses three times a day.

When the nocturnal perspiration is produced by paroxysms of coughing, medicines which allay the cough and procure sleep alleviate the sweating. It is probably in this way that Dover's powder exercises a beneficial influence over the night sweats in many cases. It may be given (without the sulphate of potash) in the form of a pill, containing a grain of opium and a grain of ipecacuanha, at bed-time. It will often arrest the night sweats during its administration, but they return immediately it is omitted;

and it has this serious drawback, that owing to the specific action of the opium in diminishing the secretion of the bronchial mucous membrane, thick tenacious mucus accumulates in the air-tubes during the night, in some cases, and causes much coughing during the early part of the day to expel it.

The influence of *belladonna*, or *atropine*, in diminishing cutaneous secretion is well known. It is, in many cases, a very effectual remedy for this symptom; but in others it fails to produce any decided effect, unless it be given in doses sufficiently large to produce most unpleasant results. Many patients object to the dryness of the throat and unpleasant taste in the mouth, and disturbances of vision, which it frequently causes. It may also set up gastro-intestinal irritation. Nevertheless, with all these drawbacks, it is a most valuable resource in the treatment of the nocturnal perspirations of phthisis. It may be given subcutaneously in the form of atropine injections, from $\frac{1}{200}$ to $\frac{1}{60}$ of a grain. The succus belladonnæ also answers well in doses of from 10 to 30 minims. The tincture and the extract may also be employed.

A number of other remedies have been suggested for the night sweats of phthisis. *Picrotoxine*, in doses of $\frac{1}{180}$ to $\frac{1}{60}$ of a grain , *Agaricine*, $\frac{1}{12}$ grain in pill; *Pilocarpine*, $\frac{1}{20}$ grain, three times a day ; *Sulphonal*, in 8- to 16-grain doses; *Camphoric acid*, 15 to 60 grains in wafers, the stomach being empty, if possible —it is said to destroy the ptomaines produced by the bacilli ; *Tellurate of sodium*, $\frac{1}{4}$ to $\frac{3}{4}$ of a grain for a dose; it is considered to act in the same way as the preceding ; it imparts an odour of garlic to the breath ; *ergot* also has been used to control this symptom, from its known influence over the vaso-motor nerves.

Sponging the body with a weak solution of belladonna has been advocated as a successful expedient.

The fact that such a variety of remedies have been suggested for the relief of this symptom is a proof of the great difficulty encountered in our attempts to control it.

Nothing is of greater importance in the management of a case of phthisis than the proper treatment of the **cough,** especially when this symptom takes, as it frequently does, a prominent place in the sufferings of the patient. Pidoux, who had an exceptional experience in the treatment of phthisis, says:* "It is impossible to possess too many means for repressing a symptom which so exasperates the disease." But in treating the cough of phthisis it is necessary to be discriminating. In the first place, we must constantly bear in mind the relation of cough to expectoration, and we must keep in view the fact that the cough of phthisis may be either—

(1) Simply a cough of expectoration: *i.e.* a cough with an object, that object being to rid the air-passages of infective secretions which have accumulated in them, and which offer an impediment to respiration; or it may be

(2) Purely a cough of irritation, a *dry* cough, which is not accompanied or followed by expectoration; or it may be

(3) Both a cough of expectoration and a cough of irritation; and this last is the kind of cough we, in nine cases out of ten, have to deal with in phthisis.

We should especially guard against the error of treating the cough of phthisis as purely a cough of irritation, to be overcome solely by the use of sedatives, such as opium, etc.

We do not undervalue the usefulness of opium, morphine, and codeia in the treatment of phthisis; for there are few cases of this disease that do not need, in some part of their course, the cautious use of opium or its derivatives. It has been said that "without opium the treatment of phthisis would be impossible." But by bearing in mind the relation of cough to expectoration, we shall best be guided to its correct management. So long as the cough is always attended with expectoration, we must be very careful in the use of opium, for opium, by diminishing bronchial secretion, causes an inspissation of the mucus in the air-passages, and makes it more tenacious and more difficult of expulsion. If a considerable dose of opium has been given overnight the patient on waking in the morning is often harassed with fearful paroxysms of coughing; coughing which has for its object the expulsion of the tenacious, inspissated mucus that has accumulated in the air-passages during the profound opium sleep.

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* "Études Générales et Pratiques sur la Phtisie," p. 428 (second edition).

The morning cough of phthisical patients is almost invariably a cough of expectoration, for in most cases of phthisis there is a tendency to tracheal and bronchial catarrh, and during the hours of sleep the catarrhal secretion accumulates, and on waking has to be expelled. To endeavour to allay this morning cough by giving opiates is commonly to do harm, for the expectoration is hindered or put off, to become more difficult when the temporary anæsthesia of the bronchial mucous membrane, which opium induces, has passed away; moreover, when opium is given at this morning hour, appetite and digestion are injuriously affected for the whole day.

The best mode of dealing with this morning cough is to promote the expectoration of accumulated secretion by giving warm alkaline drinks, to which a little alcohol may be added. It is the property of warm alkaline solutions to promote expectoration by their solvent action on mucus, and the tenacious mucus accumulated during the hours of sleep is rendered more fluid and easy of expulsion. Equal parts of warm milk and Ems or Apollinaris or Bourboule water, to which one or two teaspoonfuls of brandy or whisky or rum have been added, form an excellent drink for the purpose. Or, if more convenient, a dose or two of a mixture containing 10 grains of sodium bicarbonate and 3 grains of common salt, with 20 minims of spirit of chloroform in each dose, may be given with a little hot water or hot milk and water, until the matters to be expectorated have, in a great measure, been got rid of.

If the morning cough is treated in this way, the paroxysms, as a rule, are soon over, and a long period of comparative freedom from cough is commonly ensured.

In association with warm alkaline drinks, the inhalation of some stimulating balsamic vapour for a few minutes, together with the steam of hot water, will promote the object in view, and make it more complete, and secure a prolonged period of immunity from cough. The oleum pini sylvestris, sanitas oil, terebene, and tincture of benzoin are all useful in this way.

But, on the other hand, there are many cases, especially of advanced phthisis, in which, after the discharge of much expectoration, an irritable condition of the mucous membrane of the air-passages remains, and a cough of expectoration is succeeded by a cough of irritation. It may be necessary to inhale a few drops of chloroform, or to give some sedative syrup to relieve this; and we may have the less hesitation in prescribing this when we know we have already contributed to the clearing away of accumulated secretion in the air-passages.

Cough of this kind is often relieved by inhaling from an oro-nasal respirator a few drops of a mixture of chloroform, or spirit of chloroform and carbolic acid. So also, in some cases of phthisis, and especially in early stages, and when some dry pleurisy is found over one or other apex, or when early interlaryngeal changes have shown themselves, we may have to deal with a cough which is often purely irritative, and unattended with any expectoration; this kind of cough is peculiarly distressing to the patient, because it is without aim or object, and sometimes with little or no intermission. It is often exceedingly troublesome and fatiguing during the night, preventing sleep, and inducing feverishness and profuse, exhausting perspirations. We must spare no effort to relieve this form of cough.

When there is evidence of the existence of dry apical pleurisy—and the signs must be especially looked for in the supraspinous fossæ—counter-irritation will often prove a valuable remedy. It may be applied in the form of strong iodine paint, or, better, as small flying blisters, moved about from one spot to another over the apex, in front and behind, and repeated from time to time.

But in treating this form of cough we must be prepared for the necessity of frequently changing or modifying our remedies. Butyl chloral is a useful remedy, and may be given in 2- to 5-grain doses made into a syrup, with a little glycerine, syrup of tolu, and camphor water. Chloral hydrate and bromide of potassium, together or separately, have been found to relieve this form of cough. These remedies find their appropriate use in the case of phthisical patients of neurotic or hysterical temperament. They should be given at bed-time in 5- to 15-grain doses—the chloral acts best when combined with sodium bromide. It is advisable to reserve this remedy for occasional use, and give some other in the interval. Given about every third night, it proves frequently a valuable help in advanced cases.

We have found belladonna of great service in relieving the cough of phthisis, and the following form is a good one :—

℞ Succi belladonnæ ... ... } āā ʒj.
Spiritus chloroformi ... ... }
Mucilaginis et syrupi ... ... ad ℥jss.

Misce, fiat mistura. Take one or two teaspoonfuls for a dose.

This remedy, given at night, has the further advantage of checking the tendency to night sweats. It is useful in all forms of phthisical cough, but most so in those cases in which there is both excessive secretion, which it diminishes, and excessive irritation, which it allays. Opium and belladonna combined often act better than either separately; they correct one another. A pill containing ⅓ to 1 grain of expectorated have, in a great measure, been got rid of.

If the morning cough is treated in this way, the paroxysms, as a rule, are soon over, and a long period of comparative freedom from cough is commonly ensured.

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Heroin, recently introduced as a substitute for morphine, and reported to have a special effect on the respiratory centre, should prove a valuable remedy for the cough of the phthisical.

Codeina is a most useful sedative, as it does not disturb the functions of the stomach and liver, as preparations of opium and morphine often do, and it calms the cough in most cases. The dose of codeina is from ⅓ of a grain to a grain. One or two teaspoonfuls of the syrupus codeinæ may be taken occasionally.

The following combination of cherry-laurel water, aconite, and opium will often relieve the cough better than opium alone:—

℞	Extracti opii liquidi	♏lxxx.
	Tincturæ aconiti	♏xx.
	Aquæ laurocerasi	ʒij.
	Syrupi	ad ℥jss.

Misce, fiat syrupus. One teaspoonful for a dose.

A simple means of calming the cough of laryngeal irritation is sipping iced water; but it is often necessary in such cases to apply a solution of nitrate of silver (10 grains to the ounce) to the epiglottis and glottis. When the cough is due to irritation or hypersensitiveness of the pharynx, as it sometimes is, combined with laryngeal irritability, the pharynx and larynx being both the seat of an irritative catarrh, a good plan is first to wash away the catarrhal secretion with a warm borax gargle, and then brush the mucous membrane of the pharynx and larynx with the following solution:—

℞	Cocainæ hydrochloridi	gr. x.
	Morphinæ hydrochloridi	gr. j.
	Glycerini	ʒij.
	Aquæ camphoræ	ad ℥j.

Misce, fiat solutio.

In severe cases the patient may also be allowed to sip very slowly half a teaspoonful of this solution occasionally. The morphine and ipecacuanha lozenges of the B. P. are very convenient for the slighter attacks of cough with throat irritability. In most cases of advanced phthisis we shall be compelled to have recourse, at times, to the preparations of opium, or morphine, or heroin to allay the cough.

"In advanced phthisis," says the late Dr. Thaon, of Nice, "the results obtained from morphine are so constant and so striking that I do not hesitate to formulate the following proposition: viz. *where in a case of phthisis we have exhausted the whole materia medica, we have still a resource left in morphine.*"

The following formulæ for cough syrups will be found useful:—

℞ Morphinæ acetatis liquoris...	āā ʒij.
Aquæ laurocerasi	
Syrupi limonis	℥ss.
Mucilaginis acaciæ ... ... ad	℥jss.

Misce, fiat syrupus. Dose, a teaspoonful.

℞ Acidi hydrocyanici diluti	♏ xxxvj.
Tincturæ belladonnæ	♏ liv.
Extracti opii liquidi	♏ lx.
Syrupi limonis	℥ss.
Mucilaginis acaciæ ... ... ad	℥jss.

Misce, fiat syrupus. Dose, a teaspoonful.

When an asthmatic tendency or predisposition is associated with phthisis, opium cigarettes, or stramonium cigarettes, the cigarettes de Joy or d'Espic, will be found useful remedies for the night cough.

In the irritative cough of phthisis Wilson Fox recommended sprays of cocaine (5 to 10 per cent.), of morphine (2 grains to the ounce), and atropine ($\frac{1}{8}$ or $\frac{1}{6}$ grain to the ounce), and the inhalation of the vapour of conium. To the value of antiseptic inhalations, especially when containing chloroform, in relieving cough and diminishing expectoration we have already testified.

In all cases in which the cough is associated with profuse expectoration from co-existing chronic catarrh of the air-passages we should endeavour to diminish the amount of this secretion; for this purpose inhalations of creasote, of tar, of oleum pini sylvestris, of terebene, of spirits of turpentine are useful, and so especially is rubbing the chest night and morning with the turpentine liniment of the B.P.

The combinations of *heroin* and *terpine hydrate*, prepared by Schieffelin, of New York, should prove very serviceable in these cases.

Vomiting after taking food is a very troublesome incident which most patients with chronic phthisis complain of more or less. Soon after taking a meal, or even during it, an attack of cough comes on, the paroxysms increasing in severity until a considerable quantity of mucus is brought up, and with it the contents of the stomach. The nature of this cough has been to some extent misunderstood. It has been referred to irritation of the gastric portion of the vagus by the contact of food (Peter), and as due to a state of special irritability of the gastric mucous membrane, and therefore the remedy is to give a rapidly absorbable sedative just before taking food, such as a few drops of laudanum in a teaspoonful of water, and immediately after the meal three drops of hydrochloric acid in water.

Another view of the cause of this incident assumes that it occurs chiefly in the more indurative forms and stages of this disease, and that it is due "to the mechanical difficulty in expelling secretions from cavities and bronchial tubes, which are surrounded by dense, tough, airless consolidations" (Powell). Both these explanations, partially true as they may be, leave out of sight a very simple and obvious contributory cause. It must be remembered that, with these patients, the air-passages are in a catarrhal state, and pour out secretion profusely on any excitement. Now even in cases of simple laryngeal catarrh, as most persons have experienced, upon taking a meal, although the cough may have been absent for some time, the secretion of mucus is augmented, and coughing recommences. It is clear that on taking food and drink there is a direct stimulus given to the circulation, and by rapid absorption of fluid from the surface of the stomach the quantity of fluid in the blood-vessels is rapidly increased. This soon leads to increased secretion in the catarrhally affected air-passages, and this fresh secretion, added to what had already accumulated before food, causes a blocking up of the air-passages, and so leads to repeated and long-continued efforts of coughing to get rid of the accumulation, and at last, in the final violent contractions of the diaphragm and abdominal muscles, the contents of the stomach are expelled, mixed, as we have again and again seen with great quantities of bronchial mucus. It is also a noticeable feature that the vomiting in these cases is rarely preceded or accompanied by any nausea; it seems purely mechanical. Indeed, when vomiting after food is associated with nausea we regard this fact as indicating the existence of a morbid condition of the gastric mucous membrane, and treat the case accordingly.

Acting upon these considerations, we are in the habit of treating those patients who complain of severe paroxysms of cough, with vomiting, after or during meals, in the following manner:—Our object is to promote free expectoration, and so clear the air-passages immediately before the ingestion of food, and thereby postpone the cough after food, until the stomach has had time to digest the chief part of its contents. In order to do this the patient is ordered a small quantity of warm, stimulating drink about half an hour before a meal, and is directed to encourage rather than suppress cough, so as to get up as much expectoration as possible before he sits down to his food. A tumblerful of equal parts of hot milk and seltzer or Ems water with a tablespoonful of brandy or whisky answers well, and will usually cause a good deal of expectoration. If milk is objected to, a cupful of beef-tea or chicken-broth with a tablespoonful of brandy may be taken instead. A few deep inhalations of some stimulating vapour such as that of pinol, terebene, or sanitas oil, obtained by pouring a few drops on the surface of boiling water, will greatly aid the object in view, namely, the expulsion of all the secretion possible *before* the meal is begun. Then let there be taken at the meal *as little fluid as possible*, and give ten grains of pepsin with ten drops of dilute hydrochloric acid, in water, immediately after it.

If, however, we have reason to believe that gastric irritability is a factor in the process, then we can give some preparation of bismuth with three or four drops of dilute hydrocyanic acid, a short time before a meal. In other cases, benefit sometimes results from giving 5 minims of liquor strychninæ an hour before food.

Next as to the treatment of **hæmoptysis.**

It is not easy to estimate accurately the precise value of any particular remedy that has been used for the relief of this symptom. There are attacks of hæmoptysis which are almost immediately and of necessity fatal, as for instance many of those in the later stages of phthisis, dependent on the sudden rupture of an aneurismal dilatation of a branch of the pulmonary artery of considerable size coursing along the walls, or stretching across a large vomica. No medicine can be relied upon to stop bleeding of this kind. On the other hand, there are attacks of hæmoptysis, for the most part congestive, occurring at long intervals, and limited perhaps to a single, more or less considerable, gush of blood, followed by expectoration of blood for a short time, *i.e.* as long as extravasated blood remains in the air-passages; these require chiefly precautionary treatment to avoid recurrence. But even more protracted attacks tend, in favourable circumstances, to cease of themselves; it is not easy, therefore, when they do cease, to estimate with accuracy the precise share our treatment has had in producing this result.

It is also by no means a rare occurrence to observe a decided improvement in the physical signs and a notable arrest of the progress of the tubercular infiltration after a more or less copious hæmorrhage.

"Nothing," says Pidoux,* "is so certain to cease of itself, after a given time, as hæmoptysis, provided we do no more than protect the patient from all injurious influences"; and of the febrile forms he adds: "they follow their course, and end without being influenced, notably, by the most energetic remedies." "There are certainly cases in which a certain amount of hæmoptysis is more useful than injurious; it produces a notable diminution in the rapidity of progress of the tuberculisation." It is not, therefore, advisable in *all* cases, and especially in the congestive febrile forms, to be in a hurry to arrest the bleeding. But in every case it is of the greatest importance to give the patient and his friends confidence as to the result being favourable. Remember that there is rarely any immediate danger, and that, when there is, our art is often of little avail. Always, however, do something! There is nothing that calms and allays anxiety in the minds of patients and their friends so much, in these alarming circumstances, as being given *something to do.* We should remember how much the capillary circulation is under the influence of the emotions in some subjects, and therefore a suitable mental impression may have a distinct physical effect on the peripheral vessels, and so aid in suppressing hæmorrhage.

In the reports which patients bring us of loss of blood from the lungs we must be prepared for much exaggeration.

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* "Études Générales et Pratiques sur la Phtisie" (second edition).

Active treatment is not required in slight cases; we should see that the bowels are regulated by a mild aloetic pill, or a few doses of the aperient sulphates, as free relief of the bowels is attended by a reduction of blood pressure. The food should be cold, light, and simple, and active exercise for a time should be forbidden. If blood-stained expectoration continues, and if the mucus is thick and tenacious, and expelled with difficulty, we should prescribe 3 or 4 ounces of Ems water twice a day; if it is thin and abundant, we should order 10 to 20 minims of dilute sulphuric acid, with $\frac{1}{12}$th of a grain of morphine or heroin in a little syrup and water twice or three times a day.

A large sudden gush of blood from the lungs may usually be regarded as due to the ulcerative erosion of a vessel of some size before it has had time to become obliterated, and this form may be encountered comparatively early in the course of rapidly progressing disease; while in advanced cavity cases it may be referred to the rupture of an aneurismal dilatation of a branch of the pulmonary artery in the wall of a cavity: but serious hæmorrhages, and perhaps more protracted ones, will arise from congestion of the bronchial mucous membrane or the lung substance itself in the vicinity of advancing tubercular deposition, and those capillary hæmorrhages due to local hyperæmia are, probably, the most readily amenable to treatment.

Protracted, or more or less continuous slow hæmoptysis, is not unfrequently encountered when, in debilitated or dissipated persons, phthisis attacks lungs which are, perhaps, already the seat of degenerative emphysema. This form of hæmoptysis is, so far as our own experience has extended, exceedingly difficult to arrest.

There are certain general rules which apply to the treatment of *all* cases of hæmoptysis. These are to keep the patient perfectly quiet in bed in the semi-recumbent position, to forbid all conversation and all mental excitement; to keep the apartment cool and airy, to allow only cold light food and cold iced drinks, and to let the patient suck fragments of ice. We do not regard the sucking of ice as likely to have an important influence over bleeding from the lungs, nor is it absolutely necessary, as some appear to think, that the patient should always have a lump of ice in the mouth. We regard it chiefly as a convenient way of allaying feverish thirst without adding much fluid to the blood.

Of the various remedies advocated for the treatment of hæmoptysis, we will first refer to the use of *ergot*, *ergotine*, and *ergotinine*.

There is an overwhelming weight of testimony in favour of the efficiency of these remedies in cases of serious and copious hæmoptysis. To be useful, they must be given frequently, and in full doses; if by the stomach, a dram of the liquid extract may be given every half hour or every hour for eight to twelve doses, according to the severity of the case, and then less frequently.

Bonjean's ergotine, a purified watery extract of ergot, is a popular form for its administration.

Hertz * gives the following as a good formula for hypodermic injection: Bonjean's ergotine 40 grains, alcohol, glycerine, each 2 drams—dose 6 to 18 minims.

Or the ergotine may be dissolved in distilled water, and, if required to be kept, a little carbolic acid added to it. To avoid irritation and inflammation it is best to inject it deeply into the substance of the gluteal muscle.

A more elegant preparation, especially for hypodermic use, is the *ergotinine of Tanret*. This can be obtained in a clear white solution, which produces no irritation or inflammation of the connective tissue, as ergotine often does—the dose for injection is 3 to 10 minims.

It is in free and continued hæmorrhage (probably from a number of capillaries) that ergot and its preparations are chiefly of value. In the sudden profuse hæmoptysis of advanced cavity cases due to aneurismal rupture, or ulcerative erosion of a considerable vessel, it is not a suitable remedy. We should remember that the object of treatment in such cases is to favour the formation of a plug or coagulum at the seat of rupture.

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* Article on "Hæmorrhage of the Lungs," Ziemssen's "Cyclopædia of Practical Medicine."

Ergot is said to cause a rise of blood-pressure both in the aortic and pulmonary circuit, and therefore to be counter-indicated in pulmonary hæmorrhage—it doubtless is in *some* cases, but not in others.

Gallic acid used to be regarded as a valuable remedy for controlling and arresting pulmonary hæmorrhage; but it is now thought to have little or no astringent action.

Tinctura hamamelidis, in 30-minim doses, every hour or two, has been found serviceable in slight cases.

Turpentine is undoubtedly a valuable remedy in troublesome forms of pulmonary hæmorrhage. It may be given in capsules, each containing 5 minims, every half hour until six doses have been taken; or it may be given, in from 5- to 20-minim doses, made into an emulsion with mucilage, or yolk of egg and syrup, three or four times a day.

Sulphuric acid in the less severe and less urgent attacks, or after the arrest of such by ergotin, is an excellent remedy, and it is well, when there is no counter-indication, to combine it with sulphate of magnesia, and, if there is some feverishness, as there often is, some quinine—as in the following prescription:—

℞	Acidi sulphurici aromatici	♏x.
	Magnesii sulphatis	ʒj.
	Quininæ sulphatis	gr. j.
	Aquæ ... ... ad	℥j.

Misce, fiat haustus. To be taken every three or four hours.

Perchloride of iron is a useful remedy in some cases, especially in apyretic anæmic forms. It should be given in 10- to 20-minim doses, with a little syrup and water, every two or three hours.

Digitalis.—Some divergence of opinion exists as to the propriety of administering digitalis in hæmoptysis. But the weight of authority is in favour of its use in certain forms of hæmoptysis. Ringer recommends the infusion in large doses. "When it quiets the pulse," he says, "the bleeding ceases." Hertz advises its use when the action of the heart is very excited. Pidoux counsels digitalis in large doses in the febrile forms of hæmoptysis. Fonssagrives also considers digitalis a good remedy when fever accompanies the hæmorrhage.

It may therefore be accepted that digitalis is a valuable addition to other remedies when we desire to regulate and quiet excited action of the heart in cases of hæmoptysis.

Acetate of lead was, at one time, largely employed as a remedy for hæmoptysis, but it is less frequently used now. Its action is too slow for urgent cases, and its constipating effect makes it an inappropriate remedy in the more chronic forms of slow continued bleeding.

Common salt is an old remedy for hæmoptysis, and salt and water used often to be given by the nurses of the Brompton Hospital as an extemporary measure. Hertz considers it an efficacious expedient given in doses of a half or a whole tablespoonful, either dry or mixed with a little water, and he quotes Skoda's explanation of its action, viz. "as an irritant upon the gastric mucous membrane, producing through the sensory nerves of the stomach a reflex action upon the small pulmonary arteries, whereby the latter are contracted."

Ipecacuanha in nauseating and emetic doses has been strongly advocated in the treatment of hæmoptysis by Trousseau, Peter, and other French physicians. Having weighed the evidence for and against this mode of treatment, we are in agreement with Hertz,* that "the danger that new hæmorrhages may be produced by the jarring of the body during the act of vomiting is so apparent that this mode of treatment should meet with disapprobation, in spite of the high standing of its advocates."

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* Ziemssen's "Cyclopædia of Practical Medicine," vol. v., p. 319.

Cold, applied locally, is no doubt a powerful agent in arresting some forms of hæmorrhage, especially the sudden and profuse attacks in advanced cavity cases. Cold wet compresses, cooled by placing them on ice, may be applied to the chest; in persons very sensitive to cold a piece of ice may be enclosed in a thin pocket-handkerchief and rapidly passed over the chest.

The *inhalation of pulverised styptic solutions* to arrest hæmorrhage from the lungs has been warmly advocated by Oertel and others, but we consider this method only of use in certain exceptional cases.*

The use of *opium* or morphine or codeina, in combination with whatever other remedy may be employed, is indicated in all cases of serious hæmoptysis. There exists some difference of opinion on this point, we know, but the testimony of most writers of authority and experience is in favour of this view. Not only is it urgently necessary to quiet the cough, for every effort at coughing alarms the patient, as it is attended with fresh hæmorrhage, but the calming influence on the nervous and circulatory systems, and the lowering of blood pressure which opium and morphine exert, are also of great value.

The hæmoptysis of the *intemperate* who become the subjects of phthisis is often associated with a certain amount of venous congestion, and it is necessary in these cases to give *purgatives.* A combination of 1 dram of sulphate of magnesia with 15 minims of diluted sulphuric acid in an ounce of infusion of roses every three or four hours, and if necessary 1½ grains of extract of aloes in a pill, once a day, until we establish a free fluid discharge from the bowels, is the best treatment for such cases, which, however, generally do badly.

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* Ziemssen's "Handbook of General Therapeutics," vol. iii. Smith and Elder, London.

When we have reason to believe that the pulmonary affection is connected with syphilis, we must combine iodide of potassium with our other remedies.

Blood-letting will rarely be an appropriate remedy in the hæmoptysis of phthisis, of whatever use it may be in other forms of pulmonary hæmorrhage, as for example in the passive hyperæmia, with tendency to stasis of blood in the lungs from heart disease; and in those rare cases in robust persons which have been attributed to sudden intense pulmonary hyperæmia.

The application of blisters should be reserved for those cases of obstinate continued bleeding dependent on congestive or inflammatory hyperæmia.

We must never overlook the value of aperients as depressors of vascular tension in suitable cases. The alkaline sulphates are the best.

With regard to the use of alcohol, some differences of opinion are encountered. It must be largely left to the wisdom and discretion of the medical attendant. Small quantities of iced brandy-and-water are certainly useful in some cases, and seem to have a good effect in steadying the action of the heart, in lessening the effect of nervous shock, and in preventing fatal syncope after large losses of blood.

There are, finally, certain *prophylactic* measures which should be enforced on persons who are phthisical, and who belong to the hæmorrhagic diathesis. It is well known how readily and from what slight causes such persons bleed. They should, therefore, avoid all exciting and fatiguing games and exercises; they should not take out-of-door walking exercise when there is a cold north or east wind blowing. They should avoid hot, exciting food, and such drinks as tea, coffee, wine, and spirits, except in very small quantities. It is, however, good for them to live much in the open air of the country in fine weather. Mountain air is certainly not counter-indicated, but residence too close to the sea is often prejudicial.

Disorders of digestion.—Disturbances of digestion accompany some cases of phthisis from beginning to end, more or less gastric catarrh being almost invariably present. The constant recurrence of these gastric troubles is always of ill-omen, and the phthisical patient who eats and digests well is already on the way to amendment.

(1) Simple *loss of appetite* is one of the most common of these troubles. It is often best remedied by change of air, by removing the patient from a close, confined town residence to the pure air of the country, where rest or gentle exercise in the open air can be had.

Where it depends on feeble tone of the stomach, this may often be roused and improved by vegetable bitters combined with small doses of sodium bicarbonate, which act as a stimulant to gastric secretion when given a short time before food. The best of the vegetable bitters are: calumba, chirata, gentian, quassia, bitter orange-peel, quinine, and, perhaps, best of all, strychnine and nux vomica. Ten to fifteen minims of the tincture of nux vomica, with 10 grains of sodium bicarbonate and 20 minims of spirit of chloroform in an ounce of infusion of calumba, taken half an hour before meals, will often promote appetite.

When there appears to be no indication for alkalies, we sometimes succeed better in promoting appetite by giving 3 to 5 minims of liquor strychninæ, combined with 15 minims of dilute hydrochloric or phosphoric acid in an ounce of infusion of orange-peel two hours before meals.

(2) Loss of appetite is in many cases associated with genuine *dyspepsia*, due either to the presence of gastric catarrh or to atony of the gastric functions, defective gastric secretion, etc. This catarrhal condition is often evidenced by retching in the morning, and the bringing up of stringy stomachal mucus, or quantities of a thin watery fluid (pyrosis).

Bismuth is one of the most efficacious remedies we possess for these catarrhal dyspepsias, and when there is a tendency to vomiting from irritability of the gastric mucous membrane, a small dose of opium may be combined with it. The following is a good formula —it should be taken almost directly before food:—

℞ Bismuthi subnitratis	gr. x.
Tincturæ opii	♏jss.
Magnesii carbonatis	gr. v.
Misturæ tragacanthæ	ʒij.
Infusi aurantii	ad ℥j.

Misce, fiat dosis.

When there is much flatulent distension of the stomach and intestines during digestion very great benefit will often follow the administration of 1 minim of creasote mixed with a little glycerine and peppermint water immediately after a meal. While the alkalies prove so beneficial in some of those cases, when given *before* food, a dose of hydrochloric acid is often found of the greatest service, taken immediately *after* a meal. This is especially the case in the feeble atonic forms of dyspepsia, when there is clearly an insufficient or imperfect secretion of gastric juice; in such cases 10 to 15 minims of dilute hydrochloric acid in a little glycerine and water, with 10 grains of pepsine directly after food, may be taken.

(3) The *constipation* which attends some of those cases is best treated by an aloetic pill—1 to 2 grains of the watery extract of aloes, with ½ a grain of extract of nux vomica, and ½ a grain of powdered ipecacuanha; this pill should be taken at night, and the next morning it should be followed by a large teaspoonful of Carlsbad salts in half a tumblerful of hot water.

(4) The attacks of *gastralgia*, with obstinate vomiting, which occasionally occur in phthisical patients must be treated according to the rules laid down in a former chapter.

The occurrence of **diarrhœa** in the course of a case of phthisis will always excite the suspicion that it may be due to tuberculous ulceration of the intestine. But we may have to deal with a diarrhœa from simple intestinal catarrh, or with one due to those digestive difficulties so commonly encountered in phthisical patients. The results of treatment will enlighten us on this point, and, as a rule, the presence of severe localised continued abdominal pain will point to the existence of tubercular ulceration. Something also may often be learnt from the examination of the stools, and we should be careful to see whether portions of hard irritating scybala are mixed with the loose motions, or whether they contain mucus, or mucus mixed with blood.

The occasional diarrhœa due to intestinal catarrh, or to the irritation of retained fæces, and the sequel of constipation, will be best treated by gentle aperients, at first; perhaps the best is a small dose (a teaspoonful) of castor oil the first thing in the morning, with two tablespoonfuls of hot milk, and a teaspoonful of brandy. This dose may be repeated if necessary. If some catarrhal diarrhœa still remains it will usually yield rapidly to a few doses of bismuth subnitrate (10 grains), with sodium bicarbonate (5 grains), and compound kino powder (5 grains). Soft unirritating farinaceous foods should at the same time be prescribed.

If the diarrhœa is associated with a great deal of flatulent distension, and the passage per anum of fœtid gases, 1 minim of creasote shaken up with a tablespoonful of lime water should be given immediately before each meal, or 10 grains of salicylate of bismuth may be given instead.

Amongst other remedies for the diarrhœa of the phthisical not dependent on intestinal ulceration, perhaps none is more generally useful than *lime water*, given in ounce doses, with an equal quantity of milk, several times a day; or we may use the *liquor calcis saccharatus* in doses of 30 to 60 minims. *Bismuthi subgallas*, which has been greatly praised, is given in doses of 10 to 30 grains in the day.

In cases where there is much pain accompanying the diarrhœa, whether it is due to intestinal ulceration or not, we shall have to employ opium in some form, and it is undoubtedly better to give it by the rectum than by the stomach; a small enema consisting of 5 or 10 grains of Dover's powder (or 5 to 10 minims of laudanum), and 5 or 10 grains of tannin mixed with two ounces of starch mucilage, and injected into the rectum twice a day, will be found a very efficacious remedy; or we may use the suppositories of acetate of lead and opium (B.P.), but these are slower in their action; or a hot flannel sprinkled with laudanum may be placed over the abdomen.

The diarrhœa attending advanced tubercular ulceration is notoriously difficult of arrest; besides the means suggested above, we have found pills containing nitrate of silver ¼ to ½ a grain, and opium ½ grain, given three times a day, of great service when other remedies have failed. Sulphate of copper given in the same way has been found useful. In advanced cases we have found the *extract of coto bark* very efficacious. We give it in the following form:—

Fluid extract of coto, 60 minims.
Compound tincture of cardamoms, 60 minims.
Mix these together and triturate them slowly with mucilage of acacia, 3 drams, and simple syrup, 2 drams.
Finally add water to 6 oz.
A tablespoonful of this mixture is a dose.

In this form it is an opaque mixture, with a not unpleasantly warm and aromatic taste. We have often found two or three doses of this mixture arrest or check severe forms of phthisical diarrhœa.

ADDITIONAL FORMULÆ.

For the pyrexia of phthisis.

℞ Quininæ hydrochloridi, gr. xv.
Sodii salicylatis, ʒss.
Sodii bicarbonatis, gr. xlv.
M. et divide in pulv. x. A powder twice or thrice a day.
(*Schnitzler.*)

For the fever of phthisis.

℞ Quininæ sulphatis, gr. xxiv.
Pulveris digitalis, gr. xij.
Pulveris ipecacuanhæ, gr. vj.
Pulveris opii, gr. vj.
Extracti glycyrrhizæ, q.s.
Ut f. pil. xxiv. One three times a day. (*Heim.*)

For sub-febrile states in phthisis.

℞ Potassii bicarbonatis, ʒvj.
Liquoris morphinæ hydrochloridi, ʒj.
Aquæ laurocerasi, ʒij.
Aquæ destillatæ ad ℥viij.

M. f. mist. A large tablespoonful with as much fresh lemon-juice every four hours whilst effervescing. (*Whitla.*)

For hæmoptysis.

℞ Ergotini, ʒss.
Morphinæ hydrochloratis, gr. jss.

M. et divide in pil. x. One three times a day. (*Schnitzler.*)

For the same.

℞ Spiritus terebinthinæ, ʒjss.
Olei amygdalæ dulcis, ʒjss.
Mucilaginis acaciæ, ʒv.
Syrupi simplicis, ʒv.
M. et adde
Aquæ ad ℥viij.

F. emulsio. A tablespoonful every half hour. (*Bamberger.*)

For the night sweats.

Salicylic acid, 2½ drams.
Venetian talc, 6 oz.
Starch powder, 6 oz.
Iris powder, 5 drams.
To be applied to the surface.

(*Bamberger.*)

For the same.

℞ Agaricini, gr. jss.
Pulveris ipecacuanhæ compositæ, gr. xx.
Pulveris althææ, q.s.
Mucilaginis acaciæ, q.s.

Ut f. pil. xx. One or two at night.

(*Bamberger.*)

For the same.

℞ Zinci oxidi, gr. iijss.
Extracti belladonnæ, gr. $\frac{1}{10}$.
Extracti hyoscyami, gr. j.
M. f. pil. At bed-time.

(*Whitla.*)

For diarrhœa of phthisis.

℞ Extracti opii, gr. jss.
Syrupi aurantii, ʒv.
Infusi calumbæ ad ℥v.

M. f. mist. A tablespoonful every two hours.

For hæmoptysis with cough.

℞ Extr. fluid: Hydrastis canadensis, ʒiv.
Tinct. hydrastis canadensis, ʒij.
Codeinæ, gr. ivss.

M. f. mist. Twenty to fifty drops three times a day.

(*Scarpa.*)

Or,

℞ Bismuthi subnitratis, ʒss.
Extracti opii aquosi, gr. iij.

M. et divide in pil. x. One every two or three hours.

(*Schnitzler.*)

CHAPTER VI.

THE TREATMENT OF COMPLICATIONS OF PHTHISIS AND THE SURGICAL TREATMENT OF PHTHISICAL CAVITIES.

Treatment of Laryngeal Phthisis—Inhalations, Solvent, Disinfecting, Astringent, Emollient—Applications of Iodine and Carbolic Acid—Borax and Glycerine—Iodoform and Morphine—Orthoform—Chinosol—Cocaine—Menthol—Lactic Acid—Formalin—Protargol—Intratracheal Injections—Morphine Injections—Chloroform Inhalations. _Treatment of Pleuritis_—Anodyne Liniments—Blisters—Iodine—Paquelin's Cautery—Strapping the Chest. _Treatment of Effusions. Pneumothorax and Pyopneumothorax_—Opium and Stimulants—Introduction of Capillary Trocar—Indications and Counter-indications for Operation. _Fistula in ano. Acute Tuberculosis. The Surgical Treatment of Phthisical Cavities._—List of Sanatoria for Phthisical Patients.

THE only complications of phthisis the treatment of which it is necessary to consider here in detail are the following:—

1. Affections of the larynx and laryngeal tuberculosis; 2. Pleuritis; 3. Pneumothorax and pyopneumothorax; 4. Fistula in ano; 5. Acute tuberculosis.

The last may be either a complication of phthisis—*i.e.* a general infection arising in the course of pulmonary phthisis—or it may be the original malady; in either case its treatment may conveniently be considered in this place.

1. **Laryngeal phthisis.**—The distressing laryngeal affections which frequently occur in the course of phthisis may assume various degrees of severity, from simple catarrhal conditions to necrosis and exfoliation of cartilages and diffusion of tuberculous deposit through the mucous and submucous tissues; morbid conditions in which we are compelled to have recourse mainly to topical treatment.

In the catarrhal conditions, when *acute* or *subacute*, and when the laryngeal mucous membrane is covered with copious secretion from the bronchi and lungs, we should employ free irrigation by means of sprays of solvent and disinfecting solutions—such as Ems water, solutions of sal ammoniac, or common salt or borax (1 to 5 per cent.). When the larynx is very irritable, and even inhalation of Ems water, or weak solutions of common salt, cannot be borne, we must have recourse to emollient vapours and fluids such as the steam or spray of hot water, or of hot infusions of marsh mallow or of elder flowers, to any of which a little glycerine may be added, or a little ipecacuanha wine, together with a few drops of laudanum.

In more *chronic* catarrhal conditions, with considerable swelling of the laryngeal mucous membrane, it has been recommended (Solis Cohen) that the tumefied portions of the mucous membrane should be well painted every two or three days with a weak solution of iodine and carbolic acid, and the parts kept as free as possible from accumulated secretions by the use of an alkaline solvent inhalation, such as 5 grains of borax, 1 dram of glycerine, and 7 drams of tar water.

When **ulceration** occurs, and painful inflammatory symptoms accompany the ulcerations, and when, owing to the situation of the ulcers, they are exposed to mechanical irritation during swallowing, we encounter a condition often extremely difficult to alleviate. The insufflation of iodoform and morphine in powder (iodoform gr. iv., morphinæ acetatis gr. $\frac{1}{4}$, bismuthi subnitratis gr. ii.) is one of the best remedies for this state, but it is important that the ulcerated surface should first be thoroughly cleansed by an alkaline spray so that the powder may reach the diseased surface, and not be simply entangled in the secretions covering it. *Orthoform*, which has both anæsthetic and antiseptic properties, has been largely used as an insufflation alone or combined with iodoform (iodoform gr. iv., orthoform gr. vj.), or in solution as a spray (orthoform gr. v., spr. vini rect. and aquæ āā. ℥j.). A great advantage attending its use is that the anæsthesia it produces lasts a long time—24 hours or longer. It, however, only acts on an ulcerated surface. *Chinosol* is another drug sometimes used combined with either of the preceding. (Chinosol gr. iii., orthoform gr. vj., misce fiat pulv. For insufflation.)

For the dysphagia we have another valuable resource in the application to the parts exposed to irritation of a 10 per cent. *solution of cocaine*, or eucaine, or the spray of a 2 to 4 per cent. solution may be applied to the larynx shortly before taking food. In very severe cases we may accompany the local application of cocaine with the hypodermic injection of $\frac{1}{6}$th to $\frac{1}{3}$rd of a grain of morphine, and in most of these cases it will be advantageous to administer some part at least of the food in a peptonised form by the bowel.

Menthol has been found very useful in some of these cases. It is mixed with sweet almond oil (1 in 5), and applied by means of a mop of cotton-wool, or an endo-laryngeal syringe, or it may be combined with cocaine in an oily spray (menthol gr. xx ad xl., cocainæ gr. v., ol. vaselini ℥j ; M.).

Of agents for destroying the tubercular deposit, *lactic acid* is the most popular. It is usual to begin with weak solutions (5 per cent.), and to increase the strength to perhaps 40 per cent. if well tolerated. These and similar solutions are best applied with a mop of cotton-wool, not too wet, lest a drop of the solution should fall into the trachea and set up spasm of the glottis.

It is necessary also to previously apply an anæsthetic, such as a 10 per cent. solution of cocaine. Amongst other drugs used instead of lactic acid we may mention sulphoricinate of phenol, para-monochlorphenol, and formalin.

Formalin has many advocates. It is applied in a 1 to 10 per cent. solution of the commercial product.

Good results have also been reported from the application of a 10 per cent. solution of *protargol* "after the part has had a thorough rubbing with a 3 per cent. solution of formalin."*

Intratracheal injections of antiseptic substances mixed with a mineral oil have been extensively used in these cases. The following is a suitable formula: —Guaiacol and naphtholine, of each 2 per cent., petroleum oil, 96 per cent. About ½ an oz. is injected by means of a special syringe at a temperature of 80° to 90° F. The patient is told to inspire deeply directly the injection has been made, and to resist coughing as long as he can.

When these measures fail, operative procedures are often resorted to, such as curetting, cutting, and punching-out, and, in cases in which the epiglottis is extensively diseased, entire excision of this organ by the galvano-cautery snare has been strongly advocated.†

The *food* of such patients should be bland and unirritating, and *semi-solids* are better taken than liquids by many. Custards, jellies, junket, pounded meat, or chicken, and especially finely minced raw beef mixed with yolk of egg, are suitable, and the last has been found very serviceable.

The wearing of such an inhalation-respirator, made of perforated zinc, as we have already described (*see* p. 545, vol. i.), charged with terebene, creasote, carbolic acid, or eucalyptol, will, as Dr. Solis Cohen observes, be useful "for antiseptic, astringent, and slightly stimulating purposes," and when an equal quantity of chloroform is mixed with either of these substances, a few drops inhaled from the sponge of the respirator will often relieve the harassing cough of this painful affection better than any other remedy; or ethyl iodide may be used in the same way.

As we have already said, for the severe dysphagia, insufflations of morphine, or orthoform, or the application of a 5 to 10 per cent. solution of cocaine or eucaine may be tried, but we must not withhold from the patient who is suffering otherwise irremediable distress, in an advanced stage of this afflicting malady, the temporary comfort of a hypodermic injection of morphine or the inhalation of thirty or forty drops of chloroform.

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* "Laryngeal Phthisis," by R. Lake, p. 28. Rebman, 1901.
† *Idem*, p. 35.

Pleuritis.—Some inflammatory affection of the pleura is almost certain to be encountered during some period of the progress of a case of phthisis. This is usually due to attacks of dry pleurisy, and is often attended with a good deal of *pain*, aggravated by breathing, coughing, etc. Apart, however, from these attacks of pleuritis, phthisical patients occasionally appear to suffer a good deal from what seem to be *painful affections* of the *intercostal nerves and muscles*; these latter painful conditions of the chest wall are best relieved by friction with a liniment composed of equal parts of the belladonna and chloroform liniments of the B.P.; or a belladonna or opium plaster will relieve the more strictly circumscribed pains.

The pleuritic affections of the upper part of the chest, where they are most frequently encountered, are generally relieved by counter-irritation, especially in the form of flying blisters, or iodine paint frequently re-applied, or the application of Paquelin's cautery. When these attacks occur at the base of the chest, it is as well to fix the side of the chest affected as immovably as possible for a time, by means of strips of adhesive plaster 4 or 5 inches wide and extending from 2 or 3 inches beyond the spine behind and to the same distance beyond the median line in front. By this means the patient will be spared much of the distressing pain attending cough and inspiration, and by the enforced rest of the part affected the risk of extension of the inflammation will be lessened, or if there is risk of perforation of the pleura pulmonalis from the softening of some superficial deposit, this risk also will be diminished by this measure. If the pressure of strapping cannot be borne, relief of the pain may often be obtained by the application of a hot flannel sprinkled with laudanum.

Now and then in the course of a case of phthisis we encounter a large fluid effusion into one or other pleural cavity; how should such a complication be treated? At first, at any rate, the patient should be confined to his bed, and his diet carefully regulated, his bowels kept open, and, if there is any considerable amount of fever, some quinine (2 to 3 grains) should be given him in an effervescing saline draught every five or six hours. Should the fluid, whether serous or purulent, be removed by aspiration? We are strongly of opinion that it should not, unless its amount is so considerable that grave dyspnœa is caused by it, and then only a small portion should be removed to relieve this symptom. It will often be observed, in one-sided phthisis, if a considerable pleuritic effusion occurs, so as to compress the lung completely on that side, the progress of the disease in the lung is by that means arrested, and remains quiescent so long as the lung remains compressed by the effused fluid; but if a too zealous physician removes the fluid by aspiration the disease in the lung will usually be found to progress rapidly after the operation.

It is, therefore, in our opinion the best practice to leave pleuritic effusions in phthisical patients alone, unless urgent dyspnœa, or other adequate motive, necessitate their partial removal.

Pneumothorax and pyopneumothorax.—The pain, dyspnœa, and shock which attend sudden perforation of the lung, and the development of pneumothorax in the subjects of phthisis, are best treated by the administration of stimulants and opium. A tablespoonful of brandy, with a little water, or a dose of ammonia and ether mixture every hour for a few hours may be given, and to the latter five to ten drops of tincture of opium may be added; or if the pain and dyspnœa are very severe, a hypodermic injection of $\frac{1}{8}$th of a grain of morphine may be immediately given and repeated after an hour, if necessary.

It is scarcely ever necessary in cases of phthisis to resort to blood-letting in order to relieve the sudden hyperæmia of the uncompressed lung; this may be needed in some traumatic cases, but in most patients with phthisis who become the subjects of this complication there has been for some time slow wasting of blood, and therefore excessive hyperæmia of the unaffected lung is little to be feared. Free dry-cupping over the sound side is, however, a desirable expedient for relieving the engorgement of that lung.

The patient should be kept perfectly quiet, and not allowed to talk; the diet should consist of light, easily digested food, and an effervescing dose of citrate of potash and ammonia, to which a grain or two of quinine may be added, should be given occasionally to check the tendency to febrile reaction.

A regular action of the bowels should be secured by means of enemata if necessary, or an aloes and soap pill may be given daily. By preventing constipation, which opium, if given, is likely to produce, we avoid a further cause of dyspnœa from the upward pressure of the retained intestinal contents on the diaphragm.

When there arise evidences of considerable pressure within the thorax, such as increasing dyspnœa, and great displacement of the heart and surrounding organs, the tension of the air within the pleura must be relieved by the introduction of a capillary trocar and cannula, an operation which is perfectly harmless, and often attended by great relief of immediate distress. It is obvious that this expedient will fail to give relief unless the perforation of the lung is closed, and it is impossible to ascertain this beforehand; usually, however, when the opening is small it closes in three or four days.

Fraentzel * recommends that the trocar should be introduced between the fourth and fifth ribs, somewhat externally to the mammary line. This must, of

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* "Diseases of Pleura," Ziemssen's "Cyclopædia of Practical Medicine," vol. iv., p. 770.

course, be done with antiseptic precautions. If necessary the cannula may be retained in the chest, its opening being covered by a piece of gold-beater's skin. When it is withdrawn the small wound made should be closed with a strip of adhesive plaster, or covered with collodion, and some apply a small ice-bladder to the seat of the puncture for twenty-four hours.

If violent cough should come on (as it sometimes does) during the withdrawal of air from the pleural cavity, it must be quieted by hypodermic injection of morphine, or the trocar may be removed, and the opening compressed for a time until the irritative cough has disappeared. If this precaution be disregarded it has occasionally happened that distressing general emphysema has been suddenly induced from the air violently expelled, during cough, from the pleural cavity, entering the subcutaneous areolar tissue around the punctured opening.

Before long *suppurative pleuritis* follows the pulmonary perforation, and the pneumothorax is converted into a *pyopneumothorax.* We must be very careful, here, as in the case of serous effusion, how we interfere for the purpose of removing it.

When the other lung has been sound it has, occasionally, been observed that the occurrence of pneumothorax and consequent empyema has, by compressing the diseased lung, arrested the progress of the disease in it, and patients have been observed to live for many years with pyopneumothorax. In such cases purulent absorption is avoided by the pleural cavity becoming lined with a thick pyogenic membrane, and so suppurative fever is prevented; whereas, these patients often sink rapidly after free opening of the pleural cavity has been made to give exit to the accumulated pus. Operative interference for the removal of the effusion is only warranted when this is of such an amount that it gives rise to serious dyspnœa and dangerous displacement of the heart and surrounding organs. Aspiration may then be necessary, and this operation may have to be repeated. If this is unsuccessful, Mr. Godlee has described a method of draining and washing out the pleural cavity with an antiseptic fluid.*

If there are much pain and fever excited by the secondary pleurisy, linseed poultices sprinkled with laudanum may be applied locally, moderate doses of quinine should be given in an effervescing saline draught, and hypodermic injections of morphine, or opium by the mouth, will be required to relieve the pain and distress of the patient. Later on, should there be evidence of decomposition of the effusion, with symptoms of infective fever, operation may be needed.

Fistula in ano.—The only question that has to be considered with regard to the treatment of fistula in ano when it occurs as a complication of phthisis, is whether or not it should be operated upon. Surgeons certainly are averse from performing this operation in cases of undoubted phthisis. It has been suggested as a reason, not against operation, but against *curing* the fistula, that it acts as a useful derivative to the pulmonary lesions, and some believe themselves to have observed a kind of alternation in the activity of the fistula and the pulmonary affection.

We are disposed to regard this as more fancied than real, and to believe that if the fistula could be cured, without other risk than this, it would be altogether a gain to the patient, and save him much inconvenience and pain, and remove a cause of debility and exhaustion. But what would chiefly influence our opinion would be the general constitutional condition of the patient and the stage of his pulmonary disease, because the feverish and debilitated state in which the majority of phthisical patients are found would interfere greatly with the success of the operation, and prevent healthy cicatrisation, and this would be an all-sufficient reason for objecting to surgical interference. But if the pulmonary affection is quiescent, and the patient is otherwise in sound health, and leading a healthful life, and of average vigour, and is himself anxious to be relieved of the annoyance, we should not ourselves be disposed to offer any opposition to the operation. Another valid objection to the operation would be the possible tuberculisation of the tissues around the fistula, which would present an obstacle to healthy healing, and this possibility ought to be duly considered.

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* *See* Fowler and Godlee's "Diseases of the Lungs," p. 643.

Acute tuberculosis.—The possibility of cure, and the propriety of active treatment, of cases of acute tuberculosis and acute phthisis, have been maintained by Professor McCall Anderson, by Lebert, and by Jaccoud. The two latter maintain that they have seen anatomical proof of such cures, *post-mortem*, in persons who have afterwards died of other disease.

Jaccoud maintains that he has had under his care one case, and that the only case he has ever seen, of cured acute tuberculosis. He gives the clinical history of the case in the work we have already often mentioned.* He further states that he has seen three cases of acute tuberculosis which, instead of terminating fatally, have merged into cases of chronic phthisis. Meningitis, he states, was absent in all those cases.

His plan of treatment is to endeavour to subdue the fever with bromohydrate of quinine and with salicylic acid. The latter he appears to think may have some antiseptic action; also he has the body sponged several times a day with aromatic vinegar mixed with cold water. To relieve the dyspnœa, and to modify the local lesions, he repeatedly applies large blisters to different parts of the chest, especially over the regions where physical signs of morbid changes are found; he also has dry cupping-glasses applied to the lower limbs and trunk, morning and evening, from forty to sixty (!) at a time. When symptoms of peritoneal mischief of a certain intensity appear, such as pain, tympanites, and partial or complete immobility of the diaphragm, he applies ice continuously to the abdominal surface.

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* "Curabilité et Traitement de la Phtisie Pulmonaire," p. 289.

To support the strength of the patient, he gives wine and alcohol in quantities proportionate to the age, constitution, and habits of the patient, and to the amount of febrile exhaustion; broths, jellies, milk, and peptonised foods of various kinds are also given. He expresses a belief that more cures of acute tuberculosis would be recorded were it not for the "inertia" and "discouragements" of the physician.

Dr. McCall Anderson also believes* "that acute phthisis may be recovered from in a considerable proportion of cases."

His method of treatment rests on the two indications, "to keep up the strength and bring down the fever." For this purpose "the patient should be fed on fluid food every hour, or even every half hour, day and night; stimulants are required early in the attack, and may often be taken with advantage, even to the extent of ½ an ounce every hour." In the fever a pill of quinine (1 grain), digitalis (½ grain), and opium (¼ grain) is given every four hours, or "large doses of quinine—from 10 to 30 grains—given once in twelve to forty-eight hours, and, if possible, at the time when the temperature commences to rise." He also applies cold to the surface in some form, and prefers Leiter's temperature regulators applied to the surface of the abdomen. The patient is to suck ice freely, and the food and drinks are to be iced, the body is sponged with iced vinegar and water, and even iced enemata are sometimes used. "A considerable experience," he says, "points to the conclusion that, if we are to bring our patients labouring under acute phthisis to the harbour of convalescence, it is by attacking them at the earliest possible moment—but it must be done *with energy and with confidence as to the issue*, else it will be imperfectly done."

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* "Treatment of Pulmonary Consumption," an address by Dr. McCall Anderson, Professor of Clinical Medicine in the University of Glasgow.

Ruehle * doubts if recovery is possible from acute tuberculosis. "In the two cases of recovery which I have seen," he says, "I prefer to suppose a blunder in diagnosis was committed."

Peter appears to share the opinion of Ruehle.

For our own part we have not had the good fortune to see such recoveries as those recorded by Jaccoud and McCall Anderson, but we should be most reluctant to say that they are impossible.

The surgical treatment of phthisical cavities.—It must be admitted that the attempt to deal with phthisical cavities by surgical drainage, and the expedient of intrapulmonary injections of anti-parasitic substances into the pulmonary tissues, have neither of them been attended hitherto with very satisfactory results.

It is doubtful if ordinary phthisical cavities will ever admit of successful surgical interference, either by drainage, incision, or aspiration. It is exceedingly rare in phthisis to find a single cavity without adjacent lesions, and most commonly there is extensive surrounding pulmonary disorganisation, so that whatever alleviation of particular symptoms (profuse or fœtid expectoration, for example) might occur, it could only be temporary. Then it is not always easy to ascertain the precise situation of a cavity, unless it is quite superficial; and again, we ought always to be able to satisfy ourselves that there is complete adhesion between the costal and pulmonary pleura, or we may contribute to the production of pneumothorax. It is also most undesirable to attempt to drain a cavity through any great depth of pulmonary tissue, especially when this is in a diseased condition, and it is difficult to realise that any good could result from the drainage of such a cavity, if it communicates freely with a bronchus.

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* Article on "Acute Miliary Tuberculosis," Ziemssen's "Cyclopædia of Practical Medicine," vol. v.

We are in a position to state that very sudden fatal results have followed surgical interference with phthisical cavities, even in most skilful hands, but these fatal results occurring in private practice escape publication.

Basic bronchiectatic cavities, or cavities resulting from hydatids, may offer reasonable hope of satisfactory results from surgical operation, but we can quite confirm the belief expressed by Dr. Clifford Allbutt, that "it is not at present probable" that "ordinary phthisical cavities will lend themselves to systematic aspiration or other tapping," and that "we must seek the cure by antiseptic and aseptic atmospheres."

A LIST OF SANATORIA FOR THE RECEPTION OF PHTHISICAL (PAYING) PATIENTS.

I.—SANATORIA IN ENGLAND AND WALES.

The London Sanatorium (64 beds),
Pinewood, Wokingham, Berks.
DR. A. HILLIER, 20, Hanover Square, W., Hon. Sec.
"Moderate charges."

Crooksbury Sanatorium (20 beds),
near Farnham, Surrey.
DR. F. R. WALTERS, Medical Director.

Harbourne Sanatorium (20 beds),
High Haldon, Ashford, Kent.
P. PAGET, ESQ., Visiting Medical Officer.

Whitmead Hill Sanatorium (19 beds),
Tilford, near Farnham, Surrey.
DR. HURD-WOOD, Medical Director.

Linford Sanatorium (15 beds),
Ringwood, Hants.
DR. MANDER SMYTH.

The Hailey Sanatorium (12 beds),
Ipsden (on the Chiltern Hills), Goring, near Reading.
DR. REINHARDT, Medical Director.

Moorcote Sanatorium (12 beds),
Eversley, near Winchfield, Hants.
DR. W. LANGWORTHY BAKER, Resident Physician.

Rudgwick Sanatorium (12 beds),
near Horsham, Sussex.
DR. ANNIE MCCALL, Medical Director.

The Cotswold Sanatorium (37 beds),
near Cheltenham and Stroud, Gloucestershire.
DR. S. T. PRUEN, Medical Officer.

The East Anglian Sanatorium (35 beds),
Nayland, near Bures, Suffolk.
MISS WALKER, M.D., Medical Director.

All the preceding are inland, and within easy reach of London —one and a half to three hours. The following are also within easy reach of London—three to four hours—but are on or near the sea :—

Stourfield Park Sanatorium (45 beds),
Bournemouth.
DR. DAVID THOMAS, Medical Officer.

Alderney Manor Sanatorium (25 beds),
Parkstone, Bournemouth.
DR. DENTON JOHNS, Medical Director.

Inglewood Sanatorium (20 beds),
St. Lawrence, Isle of Wight.
DR. CHOWRY MUTHU, Medical Director.

Overton Hall Sanatorium (16 beds),
Bournemouth.
DRS. POTT and STEIN, Medical Directors.

Brinklea Sanatorium (10 beds),
Bournemouth.
DR. KINSEY MORGAN, Medical Director.

The Mundesley Sanatorium (15 beds),
Mundesley, near Cromer.
W. J. FANNING, ESQ., Resident Medical Officer.

The following are more distant from London :—

Nordrach-upon-Mendip (37 beds),
near Wells, Somerset.
DRS. THURNAM and GWYNNE, Medical Directors.

Mendip Hills Sanatorium (20 beds),
Hill Grove, over Wells, Somerset.
DR. F. HUDSON EVANS, Medical Officer.

Pendyffryn Hall, Conway (15 beds),
North Wales.
DR. J. MORTON WILSON, Physician.

Vale of Clwyd Sanatorium,
Llanbedr Hall, Ruthin, N. Wales.
DRS. GRACE-CULVERT and C. E. FISH, Physicians.

Timbercombe, Spaxton (10 beds),
near Bridgwater, Somerset.
DR. BROWN, Taunton, Medical Officer.

Dunston Park Consumptive Home (18 beds),
Paignton, S. Devon.
DR. ALEXANDER, Paignton, Medical Officer.

Bourne Castle Sanatorium,
Belbroughton, Worcestershire.
DR. PHILLPOT, Resident Physician.

Belle-Vue Sanatorium (10 beds),
Shotley Bridge, near Durham.
DR. E. W. DIVER, Resident Physician.

Sunny Nook Sanatorium (6 beds),
Eden Mount, Grange-over-Sands.
MRS. JOWETT, Trained Nurse.

SANATORIA IN SCOTLAND.

Nordrach-on-Dee Sanatorium (36 beds),
Banchory, Aberdeen.
DRS. LAWSON and BARDESWELL, Physicians.

The Grampian Sanatorium (20 beds),
Kingussie,
DR. DE WATTEVILLE, Medical Director.

Woodburn Sanatorium (20 beds),
Morning Side, Edinburgh.
DR. J. J. GALBRAITH, Medical Director.

SANATORIA IN IRELAND.

Rostrevor Sanatorium (20 beds),
Co. Down.
DR. HOWARD SINCLAIR, Resident Physician.

Altadore Sanatorium (18 beds),
Kilpedder, co. Wicklow.
J. C. SMYTH, ESQ., Medical Officer.

Rossclare Sanatorium (17 beds),
Irvinestown, Fermanagh.
DR. P. S. HICHENS, Medical Officer.

SANATORIA IN FRANCE.

The Canigou Sanatorium (100 beds),
near Vernet-les-Bains, Pyrénées Orientales.
DR. GIBESSE, Medical Director.

The Dartol Sanatorium (32 beds),
near Clermont Ferraud, Puy de Dôme.
DR. C. SABOURIN, Proprietor.

The Trespoey Sanatorium (14 beds),
near Pau, Basses Pyrénées.
DR. CROUZET, Proprietor.

Sanatorium de Gorbio,
near Mentone.

(Others are in course of construction.)

SANATORIA IN ITALY.

Sanatory Riviera,
at San Remo.
DR. CURT STERN, Physician.

SANATORIA IN GERMANY.

Hohenhonnef Sanatorium (109 beds),
near Königswinter-on-the-Rhine.
DR. E. MEISSEN, Medical Director.

The Falkenstein Sanatorium (112 beds),
Cronburg, near Frankfort.
DRS. HESS and BESOLD, Medical Officers.

The Laubbach Sanatorium (113 beds),
near Coblenz-on-the-Rhine.
DR. ACHTERMANN, Medical Director.

The Nordrach Sanatorium (45 beds),
near Biberachzell, Black Forest.
DR. WALTHER, Medical Director.

The Schömberg Sanatorium (50 beds),
near Liebenzell, Pforzheim, Black Forest.
DR. ADOLF KOCH, Medical Director.

The St. Blasien Sanatorium (62 beds),
Railway Station, Albbruck, near Basel, Black Forest.
DR. ALBERT SANDER, Medical Director.

The Wehrawald Sanatorium,
near Todtmoos, Black Forest.
DR. LIPS, Medical Director.

(All the above are in the Rhine district.)

The Brehmer Sanatorium (156 beds 1st class, 179 beds 2nd class),
Görbersdorf, Silesia, near Friedland.
PROF. DR. RUDOLF KOBERT, Medical Director.

The Reiboldsgrün Sanatorium (108 beds),
near Auerbach, Saxony.
Dr. F. Wolff-Immermann, Medical Director.

The Rehburg Sanatorium (20 beds),
Bad Rehburg, Hanover.
Dr. Michaelis, Medical Director.

Sanatorium Préland,
near Aubure, Haute Alsace.

SWISS SANATORIA FOR PAYING PATIENTS.

The Arosa Sanatorium (65 beds),
near Langweis, Canton de Grisons.
Dr. Jacobi, Medical Director.

Dr. Turban's Sanatorium (80 beds),
Davos.

Dr. Dannegger's Sanatorium (40 beds),
Davos.
Dr. Phillipi, Medical Director.

The Leysin Sanatorium (110 beds),
near Aigle, Canton de Vaud.
Dr. Exchaquet, Medical Director.

The Schatz-Alp Sanatorium (120 beds),
Davos.
Dr. Spengler, Medical Director.

Part V.

DISEASES OF THE LIVER.

CHAPTER I.

THE TREATMENT OF GALL-STONES (CHOLELITHIASIS).

Frequency of Biliary Concretions in the Gall-bladder—Their Origin—Composition—Characters and Structure—Etiology—Bacillary Infection—The Neurotic Constitution—Changes in the Composition of the Bile—Catarrh of Bile Ducts—Influence of Food Habits—Want of Exercise—The Gouty Diathesis—Corpulence—Age—Female Sex—Pregnancy—Tight-lacing. *Symptoms*—Attacks of Biliary Colic—Pain—Rigors—Rise of Temperature—Vomiting. *Indications for Treatment.* 1st. *During the Crises*—Hypodermic Injection of Morphine and Atropine—Opium by the Stomach—Chloroform Inhalation—Local Applications, Fomentations, and Poultices—Copious Warm Alkaline Drinks — Belladonna and Podophyllin—Leeches — Ether, Ammonia and Brandy for Collapse — Ice to allay Vomiting—Olive Oil in large doses—Turpentine. 2nd. *During the Intervals.* — Manipulation of the Gall-bladder—Aperients—Warm Alkaline Drinks—Cholagogues—Courses of Mineral Waters, Carlsbad, Vichy, etc.—Sodium Salicylate — Diet and Regimen. Indications for Surgical Interference—The Operations: (*a*) Sounding, (*b*) Aspiration, (*c*) Cholecystotomy, (*d*) Cholelithotrity, (*e*) Cholecystectomy, (*f*) Cholecystenterostomy. Additional Formulæ.

In reviewing **diseases of the liver** from the standpoint of clinical therapeutics we are compelled to set aside certain of these affections as either wholly uninfluenced by treatment, as for instance that rare malady, *acute yellow atrophy*, or as presenting only *general symptomatic* indications, as cancerous, sarcomatous, or other new growths in the liver, or as simply forming part of a general constitutional morbid state, as the *amyloid liver* and the *fatty liver.*

The morbid states associated with the liver which chiefly concern us now are—1. *Gall-stones* or *cholelithiasis*; 2. Certain forms of *jaundice*; 3. *Hyper-*

æmic states or *congestions;* 4. *Acute and chronic inflammations; abscess; cirrhosis;* and 5. *Hydatid cysts.*

Biliary calculi are of common occurrence in the gall-bladder, and these concretions are often found in that organ in considerable numbers, after death, without having given rise to any symptoms during life dependent on their presence there. Single concretions, large enough to fill the whole cavity of the gall-bladder and moulded to its shape, are occasionally found. These large biliary concretions occasionally ulcerate their way through the coats of the gall-bladder into the intestine (to which the gall-bladder has, previously, become adherent), and they may then be evacuated by the bowel, or may lead to symptoms of intestinal obstruction. Sometimes gall-stones ulcerate through the gall-bladder into the peritoneal cavity and set up diffuse peritonitis, which may prove fatal. Sometimes adhesions form between the gall-bladder and the abdominal wall, and external fistulæ are formed, through which these concretions are expelled. We have ourselves recorded a case in which numerous gall-stones had passed out of the gall-bladder and become infiltrated into the abdominal wall, and a great number of these were removed from the sinuses they occupied by Lord Lister.

But the symptoms dependent on *gall-stones* which usually call for treatment are those caused not so much by the existence of those concretions in the gall-bladder, as by the passage of one or more of them along the cystic and common bile ducts into the small intestine. So long as these concretions remain quietly in the gall-bladder they may give rise to no symptoms whatever, and, indeed, they occasionally pass through the bile duct into the intestine and out of the body without giving rise to any symptom, especially when they are small, or when, possibly, the duct is abnormally large, or has become distended by the previous passage of larger calculi. The symptoms which usually call our attention to the existence of gall-stones are either **pain** excited during the passage of the calculus along the cystic and common bile ducts, or **jaundice** from obstruction to the passage of the bile into the intestine by the blocking up of the common duct by the concretions, or, most commonly, both.

A few remarks as to the composition, origin, and symptoms of gall-stones will fitly precede a detailed consideration of the treatment they require.

Biliary calculi are almost invariably formed in the gall-bladder; but some, according to Naunyn, are formed in the ramifications of the hepatic duct. They vary greatly in size. As we have already said, a single stone may be large enough to fill the whole cavity of the gall-bladder; on the other hand, they are often so small as to be scarcely larger than grains of sand or small shot. These small, black, rough, irregular-shaped calculi are often spoken of as *biliary sand* or *gravel.* Between these extremes all degrees of size may be found. The smaller stones may be exceedingly numerous; as many as a thousand and upwards have been found in a single gall-bladder. The dark, smaller kinds are composed almost entirely of bile pigment; they are soft, and can easily be crushed to a coarse powder. The larger ones are composed chiefly of cholesterin mixed with bile pigment. When numerous they become facetted and angular from mutual contact and friction. Sometimes they are of soft consistency and are easily crushed; at other times they are hard and incapable of being crushed. Most commonly they have a yellowish-white or fawn-coloured surface, and on section they are seen to be composed of concentric layers with radiating lines; the pale superficial layers are usually succeeded by a dark band separating them from the deeper layers, which are mostly of a dark yellow or brown colour, due to bile pigment. Some lime salts (bilirubinate of lime) are found in the outer layer, but the majority of gall-stones contain 70 to 80 per cent. of *cholesterin,* mixed with bile pigment. The central nucleus is usually formed of bile pigment; some think the nucleus originates in a fragment of inspissated mucus impregnated with lime salts, which attracts bile pigment, and that around this cholesterin is slowly deposited.

What are the **causes** which determine this precipitation of cholesterin and bilirubin chalk so as to lead to the production of gall-stones? This is a difficult question to answer, for the mode of origin of gall-stones is involved in obscurity; their chief chemical constituents come from the mucous membrane of the biliary ducts, and Naunyn asserts that *lithogenic* catarrhs of this mucous membrane may be of infectious origin and excited by microbes, of which the *bacillus coli* is the principal offender. Those whose virulence has been attenuated are most prone to excite lithogenic catarrhs. These slight infections may arise whenever there is *stagnation of bile.* It does not happen when the bile flow is normal, and it is owing to disturbances in the flow and evacuation of the bile that biliary concretions form. The *bacillus coli* which is almost always present in normal bile may become very virulent in residual bile—*i.e.* bile retained in the gall-bladder by the presence of calculi preventing its escape. An infectious cholecystitis thus excited may cause an expulsion of calculi and so become the starting-point of hepatic colic and jaundice. This view would refer the origin of gall-stones to an infective catarrh of the bile ducts, dependent primarily upon a sluggish flow and stagnation of bile in those ducts.* This is practically the same view as that taken by Mayo Robson, who observes, "There is no doubt that catarrh of the mucous membrane of the bile passages increases the amount of cholesterin present, and that the longer the bile remains in the gall-bladder the more cholesterin it will contain. Anything, therefore, which causes stagnation of bile may dispose to gall-stones."* Some have suggested that an excess of cholesterin in the bile may be traced to nervous disturbances, especially those of an emotional nature, cholesterin being regarded as a product of nervous waste. This view is supported by the clinical observation that gall-stones are especially prone to appear in neurotic women, and it may be that over-excitement of their cerebro-spinal nervous system leads to an excessive formation of cholesterin and to its precipitation in the gall-bladder.

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* MM. Gilbert and Fournier (Paris) also assert that "Ascending infection of the bile ducts takes place with extreme frequency under very various influences. Biliary stasis is its essential condition."

But although the subjects of gall-stone are often found amongst nervous women, they occur also with tolerable frequency in persons who have no neurotic tendencies whatever, and in such cases we must look for some other explanation. The amount of cholesterin in the bile being normal, it has been suggested that its precipitation may depend on some other chemical modification in the composition of the bile, such, for instance, as a diminution in the sodium salts; or the presence of chalk (as from drinking hard water) might determine the precipitation of the colouring matter (bilirubin chalk). Again, it has been asserted that a too exclusively animal diet will cause the normally alkaline bile to become acid, and that in such acid bile a deposition of cholesterin is apt to occur. An opposite view has, however, been advanced by Mayo Robson. "It seems probable," he says, "that free cholesterin in the bile passages is due, in many cases, to the deficiency of solvents of it in the bile; these solvents being the glycocholate and faurocholate of soda, which arise from the metabolism of *nitrogenous foods.* If the supply of nitrogen in the food be limited, the bile salts will be diminished, and cholesterin may be precipitated."

"It will thus be seen that in those who take an abundance of *albuminous* materials in their food, and where, therefore, the bile salts are in sufficient quantity, there is little tendency to the deposition of cholesterin; whereas when little albuminous food is taken, and the bile salts are presumably insufficient to hold the cholesterin in suspension, gall-stones form."*

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* Allbutt's "System of Medicine," vol. iv., p. 235.

The female sex predisposes to attacks of gall-stones, and statistics show that nearly four and a half times as many women as men suffer from this affection. This may be due, in part, to the more sedentary life women lead, or the constriction of the waist by tight-lacing, etc., may be a cause. The consumption of large quantities of fatty food has been, probably without sufficient grounds, held responsible for the production of gall-stones, for those races that live almost exclusively on fats have not been found to be specially subject to this malady.

Frerichs held that very long intervals between meals favoured the formation of biliary concretions. During digestion the bile flows freely into the small intestine, and the gall-bladder gets rid of a great portion of its contents; but if the meals are very far apart, there will be a tendency to stasis of bile in the gall-bladder, which would favour the deposition of cholesterin. Habitual constipation will have the same effect.

Sedentary habits and want of exercise, by diminishing the respiratory activity and the movements of the diaphragm and the abdominal viscera, must obviously tend also to promote stasis of bile in the gall-bladder, and, at the same time, by diminishing the combustion of fats, lead to a modification in the biliary secretion favourable to deposition of cholesterin. Persons who inherit the gouty diathesis are considered specially prone to biliary as well as to renal calculi, and Beneke considered he had established a relationship between this affection and the occurrence of arterio-sclerosis. We have had occasion to notice that persons who perspire freely, and therefore lose much fluid from the cutaneous surface, and who drink but sparingly of water and other diluent fluids, are prone to become the subjects of calculous deposits both biliary and urinary. We have also seen some remarkable instances of the influence of heredity in the causation of this disease.

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* *Op. cit.*, p. 256.

The common statement that the very corpulent are most prone to attacks of gall-stones is not consistent with our own experience, and in Beneke's extensive observations this coincidence was very rare. The majority of patients who have sought our own aid for this malady have been very spare subjects, and some of them have been accustomed to very active exercise.

Age has a determining influence, and *post-mortem* examinations have shown that while gall-stones are found in only 2.7 per cent of the bodies of those who die between fifteen and thirty, 5.9 per cent. are found in those between thirty and sixty, and 15·2 per cent. in those over sixty. Feebleness of circulation in the aged, by lessening the secretion from the bile ducts, favours stagnation and inspissation of bile.

Pregnancy seems to favour the deposition of biliary concretions, probably by compression of the excreting ducts, so retarding the flow of bile; Naunyn has stated that 90 per cent. of women with gall-stones have borne children. Tight-lacing also interferes with the free flow of bile. It is probable that tight-lacing is of more consequence than pregnancy, as young women under thirty suffer from the disease four times more frequently than men of the same age.

The frequency with which gall-stones are found in connection with gastric and hepatic cancer may depend either on pressure, or on the co-existence of catarrh of the bile ducts; but some physicians believe that gall-stones are not only the frequent precursor, but the actual cause, of malignant disease. There still, however, remains, as we have already said, much obscurity about the origin of gall-stones.

The **symptoms** of *gall-stones* are chiefly those attendant on the attacks of *biliary colic*, which arise during the passage of concretions of a certain size along the excreting ducts, or are determined by their impaction there These attacks usually occur suddenly, probably at the moment when a concretion passes from the gall-bladder into the cystic duct and becomes arrested there. The pain is usually excessively severe, and starting from the region of the gall-bladder, extends from the right hypochondrium over the whole abdomen, and may shoot through to the back and right shoulder. The abdominal muscles are contracted, and there is often great tenderness over the region of the liver, and this organ may be enlarged. The severe pain is usually attended with great distress and restlessness. The pulse is small, the face is pale and pinched, the skin cool, and drops of cold perspiration often stand out on the forehead. The pain is sometimes so severe and agonising as to cause the patient to faint, and it has been known to cause acute mania, and even to be fatal. Rigors are sometimes observed with rise of temperature to 102° or 103° Fahr. Obstinate sympathetic vomiting often accompanies the attack. The intense pain is doubtless due to the slow and difficult progress of the stone along the cystic duct, or to the distension of the narrow duodenal orifice of the common duct. After a few hours, but sometimes much longer, the sufferings are usually moderated, and this remission probably corresponds with the passage of the calculus from the cystic duct into the common duct, as this is a somewhat wider canal, which becomes, however, narrower at its termination in the duodenum. When the concretion has escaped through the orifice of the common duct into the duodenum, the attack suddenly ceases. This sudden and complete relief of the pain and distress is very striking. In some instances the pain does not cease so suddenly, some irritation of the distended ducts still remaining.

Jaundice does not, of course, appear until the calculus has reached the common duct, and it is sometimes entirely absent; if the concretion is impacted in the common duct for a short period only, the jaundice will be slight, but if it should remain long impacted at the orifice of the common duct, the jaundice becomes intense; the gall-bladder becomes distended, the liver enlarged, and sooner or later symptoms of toxhæmia appear. The calculus (sometimes there are several), having passed into the duodenum, can usually be found in the fæces by careful examination.* If no calculus is found after the cessation of an attack of biliary colic, it is always possible that the stone may have slipped back into the gall-bladder. Impaction of a gall-stone in the cystic duct, although unattended with jaundice, may give rise to tumour of the gall-bladder from accumulation of secretion in it.

What leads to the passage of the stones out of the gall-bladder into the cystic duct we do not certainly know, nor why in some persons these concretions should remain all through life in the gall-bladder, giving rise to no symptoms. We have already referred to Naunyn's suggestion that in some instances the expulsion of calculi from the gall-bladder is due to the setting up of an infective cholecystitis.

Vomiting is a common symptom during attacks of biliary colic, and may occasionally lead to relaxation of the duct, and if the concretion be small it may pass on and so terminate the attack.

In cases attended with jaundice, after the attack of colic has passed off there often remains, not only great lassitude, but entire loss of appetite, nausea, with tendency to vomiting, emaciation, and dark, bile-stained urine.

Some authors describe attacks of a slighter kind, which they believe to be dependent on the passage of biliary "grit" or "sand" (*gravelle hépatique*) along the bile ducts, setting up a certain amount of irritation of the mucous lining of the ducts, not, however, reaching the intensity of an attack of biliary colic. Such patients complain of epigastric pain and discomfort, with disturbed digestion, often with slight feverish attacks, coming on in the afternoon, a subicteric tint of skin, and tenderness on pressure over the region of the gall-bladder.

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* The motions should be passed into a solution of carbolic acid, then well stirred, and passed through a fine sieve with about $\frac{1}{12}$-inch mesh.

The *indications* for **treatment** may be considered under two headings:—1. During the crisis; and 2, during the intervals.

1. The indications for treatment during the paroxysms are:—

(*a*) To relieve or calm the distressing symptoms; and

(*b*) To promote the expulsion of the calculus or calculi in the ducts, especially when the attacks are prolonged.

2. During the intervals, the indications for treatment are—

(*a*) To prevent the formation of concretions by increasing as much as possible the amount and fluidity of bile secreted and promoting the activity of its flow.

(*b*) To promote the discharge of concretions remaining in the gall-bladder; or,

(*c*) If possible, to further their solution.

It is extremely doubtful if any medicines taken into the stomach can possibly lead to the solution of the larger concretions already formed in the gall-bladder. But it seems quite possible that by modifying, to a certain extent, the physical and chemical properties of the bile, and by promoting the activity of its flow, which we may be able to do, we may prevent the further deposition of cholesterin, and also hinder the increase in size of the calculi already in the gall-bladder, or even promote the solution and softening or disintegration of the smaller forms of hepatic "gravel;" and, when the bile ducts have been dilated by the passage of large calculi, as proved by their recovery from the fæces, we may hope to promote the almost painless discharge of such smaller ones as still remain in the gall-bladder.

After we have considered how these indications may best be fulfilled by medical treatment we shall consider briefly the circumstances that may render it necessary to have recourse to surgical interference.

First, with regard to the **treatment during the paroxysm.** We must remember that the walls of the excretory bile ducts are furnished with involuntary muscular fibre, and therefore they can be excited to spasmodic contraction; that these ducts are lined with an exquisitely sensitive mucous membrane, and the contact and pressure of a foreign body, such as a gall-stone, while it excites, as we know, great pain, no doubt provokes also reflex spasmodic contractions of these involuntary muscular fibres, so that there is as it were an active as well as a passive resistance to the transit of the gall-stone along the gall-ducts. To remedy these conditions we require the aid of medicinal agents which shall produce an anæsthesia of the sensitive and excited mucous membrane, and a relaxation or paralysis of the reflexly excited muscular fibres. Clearly this is the first and most direct indication; we may, at the same time, or subsequently, attempt to increase the flow of bile so as to mechanically dilate the gall-ducts and facilitate the passage of the calculus by a sort of *vis a tergo.*

The most rapid method of relieving the pain and the sensitiveness and spasm of the bile ducts is by the hypodermic injection of morphine, and it acts best, we consider, when combined with atropine; a $\frac{1}{4}$ or $\frac{1}{3}$ grain of sulphate or acetate of morphine, with $\frac{1}{120}$ grain of sulphate of atropine, may be administered at once, and repeated after an hour or two if needful. We must be alive to the fact that there are individual peculiarities with regard to the toleration of morphine, and it is therefore well to begin with small doses. Some tolerate it well and require larger ones. If there is not very constant vomiting, opium or morphine may be given, in combination with some gastric sedative, by the stomach, and it often acts extremely well so administered, calming the reflex gastric irritability as well as relieving the local pain. We may give morphinæ hydrochlor., $\frac{1}{6}$ to $\frac{1}{4}$ grain, succi belladonnæ, 20 minims, acid hydrocyanici dil., 5 minims, in aquæ chloroformi 1 oz. This draught may be repeated, if necessary, after two or three hours. To persons who bear morphine badly this is a far safer mode of giving it than by hypodermic injection, owing to the very rapid absorption of the drug in the latter case.

If the pain is excessively severe, it may be desirable to administer a little chloroform by inhalation,* until the morphine has time to act; or if the morphine fails to relieve, we may have recourse to chloroform or ether inhalations.

It has been objected to the use of morphine and opium that they diminish the flow of bile, and that, therefore, in these cases chloroform inhalation is better, or hydrate of chloral given *per rectum*. But although morphine does no doubt diminish the secretion of bile, it seems to do so less when combined with atropine, and we have no agent at all equal to it for the sustained relief of pain and removal of spasm. The first step in the treatment of biliary colic should then, we consider, be the administration of morphine or opium. Warm baths and warm fomentations, and mustard poultices applied to the right hypochondrium and to the epigastrium have been recommended, and are doubtless useful aids in relaxing spasm and relieving pain, but they are of very little use alone, and when combined with sedatives it is difficult to say what is their precise share in producing the relief afforded. A measure which we never fail to apply, and which has been warmly commended by some of the most experienced physicians, is to cause the patient to drink large draughts of hot water in which some sodium bicarbonate has been dissolved, and we now add some sodium salicylate ; 60 grains of sodium bicarbonate and 20 grains of sodium salicylate should be dissolved in a pint of hot water, and the patient should be made to drink this in mouthfuls. If it is vomited at first, it should be persevered with until it is retained, and it should be frequently repeated until the attack has passed away. This drink not only serves the purpose of diluting and promoting the flow of bile, but it acts as an internal warm fomentation (and it should be drunk as hot as possible) which probably reaches the duodenum. It is especially valuable as a corrective to the morphine, for it promotes the flow of bile by increasing its fluidity, and so favours the mechanical urging forward of the calculus through the bile ducts after the spasm has been allayed by morphine.

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* It can be easily and conveniently given poured on the sponge of one of our inhalation-respirators (*see* vol. i., p. 545).

Expedients suggested by Mayo Robson for relief of the pain are 30 drops of spiritus etheris in two teaspoonfuls of chloroform water every quarter of an hour, and exalgine in 1 grain doses dissolved in a teaspoonful of hot water, and repeated every half hour for three or four times.

A combination of extract of belladonna and podophyllin, ¼ grain of each, in a pill has been highly lauded as a remedy for gall-stones, but we do not consider it merits the praise it has received. It is, however, advantageous, from the special action of belladonna on involuntary muscular fibre, to combine it (or atropine) with morphine in the manner we have already described.

We prefer hot drinks and hot applications to iced drinks and the local application of ice, which have been suggested.

In cases of *protracted* pain with tenderness and enlargement of the liver, the free application of leeches over the right hypochondrium has been found to give relief. If the patient should become collapsed from the exhausting effect of the severe pain, ether, ammonia, and brandy must be given to revive him. Persistent vomiting may be best controlled by swallowing small fragments of ice. Purgatives should not be given during the paroxysms, but an enema of warm soap and water with a little turpentine is useful if there is tympanitis; nor do we favour the use of emetics, from which, however, some practitioners have obtained advantage.

Olive oil in large doses has been stated by many authorities to be of great efficacy in relieving the paroxysms of biliary colic, as well as in preventing their recurrence. Some have given as much as 6 to 12 ounces at a dose. Others have given small doses, ½ an ounce to 1 ounce, three or four times a day. An immediate expulsion of calculi has been said to follow such treatment. This has, however, been denied, and it has been asserted that no true gall-stones have ever been found in the motions as a result of the administration of olive oil, but that the supposed calculi consist of oleic, palmitic, and margaric acids combined with lime, and that such concretions may be produced at any time by giving olive oil to persons suffering from defective secretion of bile.

Mayo Robson* says, "We have tried olive oil in large doses in many cases, and cannot say that we have seen much good result from its employment, unless, perhaps, in one case of impacted calculi in the common duct, where an operation was performed after the olive oil treatment had been tried for some weeks. The gall-stones were then found to yield more readily than usual to the pressure of the finger and thumb, as if the treatment had lessened their consistency." He quotes Dr. Brockbank's suggested explanation of the mode of action of olive oil. "A digested fat passes into the circulation from the alimentary canal in three forms: as unchanged fat, as the corresponding fatty acid, and as soap. All occur normally in the bile, and the amount present in the bile increases with the amount of fat taken in the diet. Oil, fatty acids, and soap all dissolve cholesterin readily and break up a gall-stone. If, then, the oil, fatty acid, and soap appear in the bile in increased amount after large doses of oil, it is very probable that the gall-stone is attacked by them, especially by the soap, and in time is dissolved or so reduced in bulk as to be enabled to pass out into the duodenum." But obviously this must be a *slow* process, whereas the original advocates of the olive oil treatment claimed *immediate* benefit and rapid expulsion of calculi as resulting from it!

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* "Diseases of the Gall-Bladder and Bile Ducts" (second edition), p. 169.

2 to 10 ounces of the oil may be given daily, either by the mouth or rectum. It is borne better *after* food.

Osler states that olive oil has proved useless in his hands.

Ralfe recommended 5-minim doses of spirit of turpentine during the paroxysm; he considered turpentine to act as a direct expulsive agent, by increasing the flow of bile, and by stimulating the muscular fibres of the gall-bladder and biliary ducts.

We come, *secondly*, to the consideration of the **treatment** of cases of gall-stones **in the intervals** between the attacks of biliary colic.

The first question which now arises is this: when, after an attack of biliary colic, and the passage of one or more angular and facetted calculi by the bowel, we are convinced there remain other concretions in the gall-bladder, is it desirable to endeavour to promote their expulsion and discharge; or, when we reflect that biliary concretions in large numbers may and do exist in the gall-bladder without giving rise to any symptoms, may it not be wiser to allow them to remain there and not make any active attempt to disturb them? The answer must, we think, depend upon the course and character of each individual case. Manipulation or "massage" of the gall-bladder with the object of expelling concretions lodged therein is of very doubtful expediency. Osler speaks strongly on this point; he says, "Expulsion of gall-stones from the bladder by digital manipulation, as recommended by George Harley, is a highly irrational procedure, not to be followed. So long as gall-stones remain in the bladder they do little or no harm in a great majority of cases. To force them on into the duct is to render the patient liable to severe colic or to the still more serious danger of permanent obstruction." And Mayo Robson says, "Were we the subjects of cholelithiasis we would not submit to massage, nor could we conscientiously recommend it to others."*

If, however, by augmenting the amount and increasing the rapidity of the flow, and diluting and diminishing the viscidity of the bile, or by altering its chemical characters, as by increasing its alkalinity, we can prevent the further deposition and formation of concretions, or promote the rapid discharge of numbers of small ones already accumulated in the gall-bladder, which periodically expose the patient to great suffering or to continued loss of health, it is certainly right and necessary to do so.

After the cessation of a paroxysm of biliary colic it is advisable to give some mild but efficient aperient, and to continue to administer freely warm alkaline drinks; we shall thus promote the free secretion and outflow of watery bile, and minister to the discharge of such small or moderate-sized concretions as can pass easily through the excretory ducts. Numbers of calculi may often by such means be discharged and collected from the alvine evacuations.

The idea of giving medicines to dissolve the concretions in the gall-bladder—as, for instance, Durande's mixture of ether and turpentine—is not tenable; and if the use of this mixture has been attended by any good result, it would probably be on account of its anti-spasmodic and stimulating properties, or it is possible it may be of use as an anti-bacillary agent. Ralfe was an advocate of its use. He *thought* it exerted an antiseptic action on, and arrested decomposition of, bile; and that it prevented the formation of "recurrent" gall-stones, "either by expelling precipitated cholesterin, mucus, and pigment before they have time to form in concretion; or else by preventing precipitation by its action on the bile and biliary passages." It is needless to say that it is useless to give drugs with the idea that they can exercise any direct solvent influence on the concretions in the gall-bladder. They can only act on the contents of the gall-bladder by causing modification of the biliary secretion.

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* "Diseases of the Gall-Bladder and Bile Ducts" (second edition), p. 170.

Calomel, castor oil, podophyllin, euonymin, iridin, sodium salicylate, all have their advocates, as cholagogues * to be given to favour the removal of concretions from the gall-bladder. Perhaps as useful a means as any consists in giving ½ grain of calomel with 4 grains of compound rhubarb pill every night at bed-time, and 2 drams of Carlsbad salts in a tumblerful of hot water early the next morning, and this latter dose may be repeated after an hour or two if free evacuation has not been produced; or we may give 2 grains of euonymin or a ¼ of a grain of resin of podophyllin, or, better still, 4 grains of iridin in place of the calomel. If we adopt the plan of giving an ounce and a half of olive oil every night, the addition to it of a dram of castor oil will greatly increase its activity. The long-continued use of sodium salicylate † has been advised, as an active cholagogue rendering the bile more abundant and more fluid, and also acting as an antiseptic. It may be given in doses of 15 grains three times a day with 10 grains of sodium bicarbonate dissolved in 4 ounces of warm water.

While we are giving these cholagogue aperients, and so possibly causing a considerable loss of watery fluid by the bowels, we should, at the same time,

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* Mayo Robson's observations on a case of biliary fistula serve to show that many supposed cholagogues diminish rather than increase the amount of bile excreted; but this is probably due to their purgative action hurrying through the small intestines and out of the body substances out of which, when duly absorbed, *bile is formed.*

† Hare's "System of Practical Therapeutics" (new edition), vol. ii., p. 463.

insist on the consumption of considerable quantities of warm alkaline fluid by the mouth, so as to make the bile thinner and hasten its movements through the ducts. A tumblerful of Vichy or Vals water, warmed, or, what answers pretty nearly the same purpose, a tumblerful of hot water, with 20 grains of sodium bicarbonate dissolved in it, should be drunk slowly three times a day—half an hour before lunch and dinner and at bed-time. Courses of mineral waters, such as Carlsbad, Marienbad, Vichy, Kissingen, Brides, and others, have justly acquired a great reputation in the treatment of gall-stones. They act as cholagogues, as purgatives, and as diluent alkaline fluids; and in resorts such as Carlsbad, where strict dietetic measures are also enforced, a very beneficial influence no doubt may be produced on the constitutional vice upon which their formation depends.

But it is by no means always essential that patients should be at the trouble and expense of travelling to these resorts, if they will be content to submit to the same orderly and strictly regulated life, and drink the imported waters, raised to a proper temperature, at home. We have obtained excellent results from the application of courses of Carlsbad waters in cases of gall-stones, at home, when the patients have been willing to consent to adopt the strict regimen we have prescribed.

That the Carlsbad waters act in the manner we have suggested is admitted by those who have had the largest possible opportunities of watching their action. "The disappearance of stones," says Kraus, "is not due to their being dissolved . . their elimination is caused by the mechanical action of the waters . . by the thinner and normal condition of the bile during their use, by which the formation of fresh concretions is evidently prevented."* When, as often happens at Carlsbad, calculi of large size are eliminated, severe attacks of colic frequently occur, followed often by jaundice. This is one reason why it would be better for many patients, if they would submit to the regimen necessary, that they should take a course of Carlsbad at home. Naunyn has expressed a belief that hot Carlsbad water acts rather by stimulating the muscular coat of the gall-bladder than by its chemical action on the bile, and he states that he has found the injection of large quantities of warm water into the rectum act similarly.

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* "Carlsbad, its Thermal Springs and Baths." London, Trübner.

The Vichy course is also of great value in the treatment of gall-stones, and leads to their elimination, often with attacks of biliary colic, as at Carlsbad. But the Vichy water, being in the main simply a solution of sodium bicarbonate, has little or no effect over the constipation from which such patients constantly suffer, and it is usual there to prescribe the occasional additional use of an aperient water, such as Apenta.

The diet and mode of life of a patient who is the subject of gall-stones should be carefully regulated. If his or her mode of life is sedentary it should be altered, and a certain amount of active physical exercise insisted upon. Too many hours passed consecutively in the recumbent position should also be prevented, and six or seven hours only in bed might be supplemented by an hour or two of repose in the afternoon. If the patient, on the contrary, is of active habits, but accustomed to perspire very freely on exertion, we should insist on the excessive loss of water by the skin being more than compensated for by the free use of dilute alkaline drinks, such as Apollinaris, soda, or seltzer waters, or simple pure soft or distilled water (not water rich in lime salts). It is best that these be drunk warm, slowly, and when the stomach is empty, as at bed-time, or an hour or half an hour before meals. Mental labour should be restricted within moderate limits, and all causes of emotional excitement, when possible, avoided. Constipation should be guarded against. When the action of the skin is defective this should be stimulated by hot baths daily, or on alternate days, followed by cold sprinkling and friction with a rough towel, or by gentle massage.

Females should be cautioned against the dangers of tight-lacing, or of wearing tight bands round the waist.

The **diet** should be strictly moderate, and excess of food of any kind must be avoided. It has been assumed rather than demonstrated that an excessive consumption of fat favours the production of an excess of cholesterin, and so promotes the formation of biliary concretions, and an avoidance of animal fats is usually urged in these cases. This may be true of animal fats, but it certainly does not appear to be so with regard to vegetable fats, such as olive oil, as attacks of gall-stone are said to be rare amongst Italians, who consume olive oil freely.

Sugar and farinaceous foods should be taken only in very small quantities; bread should be eaten sparingly, and best in the form of dry toast. We have already quoted Mayo Robson's reasons for considering that a diet composed largely of albuminous materials is better for such patients than carbo-hydrates, which should be taken in great moderation. Animal food should form the basis of the diet, or such vegetable foods as are rich in nitrogen. Free use may be made of fresh green vegetables, salads, and ripe fruits; the coarse, hard, indigestible kinds, of course, must be avoided.

For a beverage, a little sound hock, still Moselle, or Bordeaux wine, mixed with some alkaline table water, may be permitted.

Finally, it remains to be considered when **surgical interference** may be necessary in the treatment of gall-stones.

1st. A stone impacted in the cystic duct, although unattended by jaundice, may give rise to so much suffering, and may lead also to such great dropsical distention of the gall-bladder as to call for surgical operation; and the same will sometimes be the case with large calculi in the gall-bladder, as they not unfrequently give rise to severe attacks of pain, possibly owing to fruitless attempts to pass out of it.

2nd. When gall-stones are impacted in the common duct, and give rise to intense and permanent jaundice, and all medical treatment fails to give relief, our only resource is surgical operation; the difficulty here, however, is one of diagnosis, for very similar symptoms may be caused by obstruction of the common duct from malignant disease, and such cases are very unsuitable for operation. Osler states that the existence of the following combination of symptoms is characteristic of obstruction of the common duct by gall-stones: (1) Jaundice of varying intensity, deepening after each attack of colic, and persisting for months, or even years; (2) ague-like paroxysms, consisting of chill, fever, and sweating, followed usually by intensification of the jaundice; (3) at the time of the paroxysm pains in the region of the liver, with epigastric disturbances.

3rd. Empyema of the gall-bladder, or evidence of suppuration in its neighbourhood, would call for operation.

4th. Operation may be indicated when acute peritonitis arises as a complication in a case which has been previously recognised as one of gall-stone.

The following are the various operations which have been performed in connection with such cases:—

(1) *Sounding*, *i.e.* introducing a long fine needle, or a fine probe, through a cannula, to sound for stones in the gall-bladder. This operation has proved fatal, and is generally rejected by surgeons, who prefer, if exploration is necessary, to make a small incision over the gall-bladder, so as to introduce the finger.

(2) *Aspiration*, by means of a fine perforated needle, in cases of distended gall-bladder. This operation, however, is not exempt from risk, and can rarely give more than temporary relief. Great care

must be taken, by cleansing the surface to be punctured as well as the needle to be used, that asepsis is secured, and the gall-bladder should be completely emptied, and all tension removed.

(3) *Cholecystotomy*, or making an opening into the gall-bladder. This is the favourite operation for the removal of gall-stones, and has been performed many times by a great number of surgeons.

The results have been very favourable in the hands of expert operators, especially in cases without jaundice or with only slight jaundice, somewhat less so in cases of long-existing jaundice, and very unfavourable in cases of malignant obstruction.

(4) *Cholelithotrity* may be combined with the preceding when calculi are found impacted in the cystic or common duct, and cannot be dislodged until they have been broken up. Sometimes a round needle is pushed through the wall of the duct into the concretion so as to break it up, or the calculus, when soft, may be compressed between the finger and thumb; or when harder it may be crushed by forceps, the blades of which are protected with rubber. The fragments are often allowed to pass away by the natural channels.

(5) *Cholecystectomy*, or the removal of the gall-bladder. This has been advocated as a better operation than cholecystotomy, as it avoids the risk of a biliary fistula which sometimes follows the latter, as it is easier to perform, and as the possession of a gall-bladder is not essential to health.*

(6) *Cholecystenterostomy* is an operation which has for its object the establishment of a fistula between the gall-bladder and the intestine, in cases of incurable biliary fistula, due to insuperable occlusion of the common bile duct and obstructive jaundice, from the same cause.

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* This subject is fully argued by Mr. Mayo Robson in his work on "Diseases of the Gall-Bladder and Bile Ducts," to which we must refer the reader for full particulars as to the details of all these operations.

ADDITIONAL FORMULÆ.

Durand's solvent for gall-stones.

℞ Olei terebinthinæ, ʒiij.
Ætheris sulphurici, ʒij.

M. Half a teaspoonful night and morning (in some vehicle).

Powder for gall-stones.

℞ Sodii benzoatis }
Sodii salicylatis } āā gr. lxxv.
Pulveris nucis vomicæ, gr. vij.

M. et divide in pulv. xx. One three times a day for two months.

Or,

℞ Sodii benzoatis }
Sodii salicylatis } āā ʒj.
Pulveris rhei }
Pulveris nucis vomicæ, gr. v.

M. et divide in pulv. xx. One at each meal. (*Huchard.*)

Turpentine emulsion for gall-stones.

℞ Olei terebinthinæ, ♏v.
Misturæ acaciæ, ℥ss.
Sodii sulpho-carbolatis, gr. xx.
Spiritus chloroformi, ♏xv.
Aquæ menthe piperitæ ad ℥j.

M. f. haust. To be taken three times a day. (*Ralfe.*)

Glycerine in biliary colic.

Four to six drams to be taken during the attack.

One to three drams in alkaline water, daily, to prevent attacks. (*Ferraud.*)

Chloroform mixture for biliary colic.

℞ Chloroformi, ♏xv.
Tincturæ myrrhæ, ♏xv.
Mucilaginis, ʒij.
Syrupi ad ℥iv.

M. f. mist. A tablespoonful every fifteen minutes. (*Lemoine.*)

Another.

℞ Chloroformi, ʒss.
Olei amygdalæ dulcis, ʒj.
Syrupi aurantii, ℥jss.

M. f. mist. A tablespoonful every quarter or half hour. (*Tourasse.*)

Another.

℞ Chloroformi, ʒijss.
Alcoholis diluti, ℥ijss.
Syrupi aurantii, ℥viij.

M. f. mist. A small wineglassful twice a day. (*Bouchut.*)

Suppositories for biliary colic.

℞ Extracti belladonnæ, gr. ⅛.
Extracti opii, gr. ss.
Olei theobromæ, ʒjss.

M. f. suppos. (*Dujardin-Beaumetz.*)

Rosenberg's olive oil mixture.

Olive oil, 5 to 7 oz.
Brandy, ½ oz.
Menthol, ½ dram.
Yolks of 2 eggs.

Mix. To be taken in three or four hours, two tablespoonfuls at a time.

Solvent for gall-stones.

℞ Chloroformi }
Ætheris sulphurici } āā ʒss.
Olei terebinthinæ, ℥j.
Sacchari albi, ʒij.
Mucilaginis acaciæ, ℥ij.

M. A teaspoonful three times a day. (*Jackson.*)

CHAPTER II.

THE TREATMENT OF JAUNDICE.

Two forms of Jaundice—(1) *Jaundice from Obstruction*—Etiology. Gall-stones—Catarrhal causes—Stricture of Duct—Compression from Malignant and other Growths or Tumours—Mental Depression—Symptoms of Obstructive Jaundice—Discoloration of Skin and Urine—Itching of Skin—Loss of Appetite—Constipation—Pale Stools—Slow Pulse —Depression of Spirits, etc. —*Indications for Treatment in Catarrhal Cases*—Local Applications—Diet—Warm Alkaline Drinks—Aperients—Enemata of Cold Water, etc. —Emetics—Ipecacuanha—Nitrate of Silver—Quinine and Arsenic in Malarial Cases—Colchicum—External Treatment—Courses of Mineral Waters in Chronic Cases—Carlsbad, Vichy, etc.—Nitro-hydrochloric Acid—Diet in Chronic Cases—Intestinal Catarrh and Antiseptics—Treatment of the Cutaneous Irritation—Baths—Warm Drinks—Pilocarpine—Warm Clothing—Treatment of Cholæmia—Gymnastic Exercises—Diuretics—Tonics—Change—(2) *Non-obstructive Jaundice*—Etiology—Absence of Special Therapeutic Indications. *Jaundice of New-born Children.* Additional Formulæ.

When, from any cause, the colouring matter of the bile fails to be normally eliminated and mixes with the general circulation, so that the patient's skin becomes stained *yellow* with bile pigment (*bilirubin*), he is said to have **jaundice.**

Jaundice, therefore, is but a *symptom* which may be dependent upon a variety of morbid states, as we shall see; it has, however, been aptly said that "jaundice is a symptom with symptoms."

As a symptom jaundice also arises in the course of diseases which are wholly incurable and unamenable to any kind of remedial treatment.

Jaundice is often described as of two kinds; that is to say, as arising in two different ways. *First*, jaundice from *obstruction* to the outflow of bile along the biliary ducts, so that the bile is re-absorbed into the blood; and *secondly*, jaundice arising *without obstruction* and re-absorption, and supposed to be dependent on certain blood changes. These two forms are often spoken of as *Hepatogenous* and *Hæmatogenous* jaundice.

Much obscurity still surrounds the mode of production of the latter form, and it would be out of place here to enter upon the many debatable points that have arisen in connection with this subject, more especially as they have no therapeutic significance.

The chief therapeutic interest in regard to jaundice is to be found in connection with the first class of cases—those of jaundice from **obstruction**; and it is to the causation, symptoms, and treatment of these cases that we shall first direct our attention.

A common cause of jaundice from obstruction is the presence of biliary concretions in the bile ducts. The presence of gall-stones in the ducts, however, is not always, or necessarily, attended with jaundice. A concretion in the cystic duct, although it may lead to retention of mucus secreted by the gall bladder, and so cause distention of this organ and all the symptoms of gall-stone colic, does not cause jaundice, as it leaves the common duct free for the flow of bile into the intestine. So also an angular stone of comparatively small size, although it might be in the common duct and give rise to considerable suffering during its passage through it, yet might leave room for the bile to flow on into the intestine, and there would be no jaundice. The treatment of this form of obstruction has already been fully considered in the preceding chapter on the treatment of gall-stones.

It is clear that jaundice from obstruction may occur either from an obstacle within the ducts blocking the bile channel, or from disease of their walls attended with tumefaction or constriction, or from pressure from without compressing and obliterating the channel.

An obstacle within the duct is most likely to be a gall-stone, although merely inspissated bile and hepatic sand or gravel, or a plug of mucus may temporarily obstruct the duct and cause jaundice.

The common duct has also been found obstructed by an intestinal worm.

It is generally believed that one of the most common causes of jaundice, especially of the milder forms of short duration, is an inflammatory **catarrhal** condition of the common duct, or perhaps more frequently a catarrhal swelling and obstruction of the duodenal opening of the common duct, arising in connection with an attack of catarrhal gastro-duodenitis. We speak of such attacks as attacks of catarrhal jaundice, and they may doubtless arise in connection with chill or with dyspeptic attacks from offending ingesta. Some physicians appear to think that we assume too much in referring most of these mild and brief forms of jaundice to catarrhal causes, and argue that this view is not supported by the occurrence of analogous catarrhal attacks in other strictly limited portions of mucous membrane. But we may point out, in the first place, that the duodenum must, from its position, bear the brunt, as it were, of much of the irritation that arises from faulty gastric digestion or from the introduction of indigestible substances into the alimentary canal; the passage into the duodenum of excessively acid chyme may often provoke a temporary catarrh of that organ, and the reason temporary jaundice does not occur more frequently from this cause is no doubt due to the circumstance that the catarrh does not generally extend to the common duct or involve its orifice, at any rate to a degree sufficient to present an insurmountable obstacle to the flow of bile through it.

And in the second place we certainly *are* familiar with the circumstance that there is great individual peculiarity as to the sensitiveness of particular limited portions of mucous membrane to catarrhal changes, from *chill* or other irritants. In some the nasal mucous membrane, in others the laryngeal, in others the pharyngeal, in others the bronchial, although in actual continuity, will sometimes become catarrhal alone without any involvement of the others.

So also some persons after exposure to chill will at once show signs of a slight vesical catarrh, others of intestinal catarrh, and so on; so that there is abundant analogical support in favour of the view that these attacks of jaundice are catarrhal.

The common duct may also become obliterated by *stricture*, caused by the cicatrisation of an ulcer produced by the irritation of a gall-stone, or, in very rare instances, a polypus or other growth may arise within the duct and obstruct it; these and sundry other obstructive conditions can, it is clear, be only relieved by such surgical interferences as we have referred to in the last chapter.

There is also little to be done by way of medical treatment for those cases of obstructive jaundice that occur from compression of the bile ducts by malignant or other growths arising in their neighbourhood Enlarged glands, tubercular or cancerous, in the fissure of the liver, or malignant or other growths connected with that organ, or with the pancreas, stomach, omentum, etc., or aneurisms of adjacent vessels, or fæcal accumulations in the colon, or a pregnant uterus may cause jaundice by pressure upon the excretory ducts. Many of these conditions are not amenable to medical treatment, and an accurate and certain diagnosis, without operative exploration, is often quite impossible.

A peculiar class of cases are those due to *mental shock* or depressing emotions, and they have been referred to the group of cases of obstructive jaundice because they are supposed to be due to "lowering of blood-pressure in the liver, so that the tension in the smaller bile ducts is greater than in the blood-vessels."

The jaundice that sometimes occurs, in greater or less degree, in association with active and passive hyperæmia of the liver, and in cirrhosis, needs no special consideration apart from these diseases. It is no doubt of obstructive origin.

It will be evident, then, that apart from those cases already dealt with in considering the treatment of gall-stones, it is chiefly catarrhal cases that can effectively be relieved by medical treatment.

The **symptoms** observed in **obstructive** jaundice are the following: 1. The most striking symptom, and the one from which the disease is named, is the *yellow discoloration* of the skin, which may vary from a pale yellow tint to an olive green, or even greenish black, according to the completeness or duration of the obstruction. It is in cases of permanent obstruction that these darker tints are encountered. 2. Distressing *itching* of the skin is a very common symptom in chronic cases; other forms of cutaneous irritation also often appear—lichen, urticaria, etc. 3. Some of the secretions, and especially the urine and the sweat, are coloured with bile pigment. This change is sometimes manifest in the urine before the skin is affected. 4. There is often nausea, entire loss of appetite, and consequent emaciation. 5. The motions lose their natural dark colour and become pale drab or clay-coloured, and they are often very fœtid, owing to the absence of bile from the intestinal canal. Usually there is constipation, and at other times, from the irritation of intestinal decomposition, there may be diarrhœa with flatulence. 6. Great slowing of the pulse has often been noted in jaundice (to 50, 30, or even 20 in the minute). 7. A proneness to hæmorrhage and to ecchymoses is a well-known feature in jaundice, especially in the severe forms. 8. Languor, sleepiness, melancholy, and great depression of spirits are notably present in these cases. Other features of *cholæmia* or bile intoxication, which may appear in aggravated and protracted cases, are convulsions, delirium, and even sudden and fatal coma.

The existence of more or less enlargement of the liver may often be made out in these cases.

Simple catarrhal cases are usually characterised by the absence of severe local pain and the somewhat rapid development of jaundice while in a condition of fairly sound health, and commonly after exposure to chill, or an attack of dyspepsia.

The *indications for* **treatment** in catarrhal jaundice are : 1st, to allay the catarrhal inflammation and swelling, and so remove the obstruction of the duct; 2nd, to further the removal of the obstacle by, if possible, promoting the flow of bile; and 3rd, to combat the symptoms due to the presence of bile in the blood and its absence from the intestine.

The first indication is best carried out by the local application of hot poultices of linseed meal and mustard; these are especially useful when there is some enlargement of the liver, with tenderness or uneasiness in the epigastric or right hypochondriac region. At the same time there should be a strict limitation of the diet to the simplest and plainest forms of food, and even these should be taken in small quantity. It should be remembered that the stomach and the duodenum are assumed to be in an inflamed and catarrhal condition, and that functional rest is of all measures the best for the removal of this state. The food then should, for a time, consist, if practicable, exclusively of warm milk and water, or, better still, of warm milk with an equal quantity of Vichy or Apollinaris water, or, what does equally well, of warm milk and water with 10 grains of sodium bicarbonate to each breakfast cupful. Those warm dilute alkaline drinks, which may be given almost *ad libitum*, are soothing to the irritated mucous membrane of the stomach and duodenum; they remove acidity, and they favour the secretion of thin and highly-fluid bile, while they also tend to dissolve any stringy or inspissated mucus they may come in contact with. If the patient will not be content with so rigorously abstemious a regimen, we may allow, in addition, some thin peptonised cocoa and milk, or peptonised gruel, made with finely-ground oatmeal, or some thin arrowroot, or we may permit, occasionally, a little consommé thickened with sago or tapioca. At the same time the patient should drink freely of warm

Vichy, Vals, or Apollinaris water, or a weak, warm solution of sodium bicarbonate. The bowels should be kept freely relieved, and any tendency to engorgement of the portal vessels removed by mild unirritating aperients, which will also favour the mechanical displacement of any plug of mucus which may possibly be obstructing the duodenal orifice of the bile duct. At the commencement of the treatment a small dose of calomel, ½ a grain or a grain, with 2 grains of extract of henbane at bed-time, followed the next morning by one or two teaspoonfuls of Carlsbad salts in a tumblerful of hot water, is perhaps as good an aperient as can be given. Afterwards, 2 grains of euonymin or 4 grains of iridin may take the place of the calomel, but the Carlsbad salts should be continued until the jaundice shows signs of abating, or until the obstruction has been removed, as would be evidenced by the reappearance of bile in the motions. It is needful to watch for any change in the appearance of the stools, as from these we derive the first intimation of the yielding of the obstruction. We do not approve of the use of strong "cholagogue" purgatives with the view of causing an increased secretion of bile, and so forcing on, as it were, the obstacle, for already the bile ducts are over-distended by retained bile, and we doubt if, in these circumstances, any attempt to exert a stimulating effect on the liver cells would be effectual. The real use of aperients is to carry off decomposing fæces, and so to relieve flatulent distention and prevent possible blood contamination, while by the intestinal commotions which they cause, especially when aided by gentle friction or manipulation of the abdominal surface, they mechanically promote the onward flow of the bile retained in the gall-bladder and bile ducts, and so tend to overcome the obstruction.

The injection of cold water (temperature, 60° F. gradually raised to 72°) into the rectum slowly by means of an irrigator, from 40 to 50 ounces at a time, according to the tolerance of the patient, and retained as long as possible and often repeated, has been advocated by Krull (and lauded by Dujardin-Beaumetz) as a cure for catarrhal jaundice; we are, however, more in accord with Osler, who says, "This practice has been followed in my wards for several years, but I cannot speak warmly of the results." But if it should be found difficult to overcome the tendency to constipation by such aperient measures as we have indicated, we would give twice daily large enemata of warm water containing sodium sulphate and carbonate, ½ ounce of the former and a dram of the latter to each pint. These should be given in the knee-elbow position or with the buttocks raised on a hard cushion, and retained for ten or fifteen minutes, or even longer. Some physicians recommend an emetic to be given at the onset of catarrhal jaundice—20 grains of powdered ipecacuanha in half a pint of hot water every half hour until vomiting is produced; by this means, they believe, sufficient pressure on the bile passages may be produced to dislodge a plug of mucus or other obstacle in the biliary canal.

In place of warm solutions of sodium bicarbonate, which, as we have said, we think the best remedy, others use sodium phosphate, benzoate, or salicylate, or ammonium chloride. Any of these may be employed, but we do not believe they will be found more efficacious than sodium bicarbonate. If the jaundice does not quickly disappear or diminish in intensity, other remedies may be applied. Small doses of ipecacuanha, ¼ of a grain to a grain thrice daily, may be given as a hepatic stimulant. On the supposition that the duodenal mucous membrane is in a state of chronic catarrh, nitrate of silver has been advised in pill given on an empty stomach. If there should be reason to regard the attack as possibly of malarial origin, it may be necessary to administer quinine or arsenic; or if there be a presumption in favour of a gouty irritation of the bile ducts, colchicum, in combination with alkalies, will be likely to give relief.

We may here mention Gerhardt's method of treating obstructive jaundice, which consists in passing a faradic current through the gall-bladder, one pole of the battery being placed on the spine, and the other over the distended gall-bladder—the object being to produce a general contraction of the muscular fibres of that organ. He has seen the gall-bladder diminish greatly in size, and a bilious evacuation follow two such applications.

When the disease tends to become **chronic** and we are able to eliminate all other possible causes than a chronic catarrhal condition of the bile ducts, we may have to consider other methods of treatment.

In such cases, just as in cases of jaundice from gall-stones, mineral-water treatment at such spas as Carlsbad, Vichy, etc., often proves most serviceable. The movement of travel, the regular exercise in the open air, the regular bathing, the strictly-prescribed dietary, combine to promote the remedial effects of the warm, saline, alkaline waters. When aperient action is required, Carlsbad or Marienbad is the more suitable, and Vichy is better when no such aperient action is needed. The diluent effect of large draughts of warm alkaline water is, as we have previously pointed out, an obvious remedial agency in these cases. A favourite remedy in some of these cases, especially in Anglo-Indians, is dilute nitro-hydrochloric acid, both internally and externally. Twenty minims of the dilute acid in 1½ ounce of infusion of calumba may be given three times a day, an hour before meals. For tropical use, 3 ounces of nitro-hydrochloric acid should be added to a gallon of water of a temperature of 98° F.; this may be used as a foot-bath, and the legs, arms and abdomen may be sponged with it; or it may be applied to the hepatic and abdominal region by means of a broad flannel roller, soaked and wrung out in the acid. Two thicknesses of this should be wound round the abdomen, and then covered with oil-silk. It should be worn regularly under the dress and changed morning and evening. Dr. Musser appears to think the prolonged use of nitrate of silver of very great value in these chronic cases.*

The absence of bile from the intestine has usually been regarded as giving rise to symptoms calling for treatment, such as constipation, putrefactive changes and acidity of the intestinal contents, causing distressing flatulence, together with imperfect assimilation of fatty matters. But Mayo Robson concludes from the elaborate study of a case of biliary fistula, in which no bile entered the alimentary canal, that an entire absence of bile from the intestine is quite compatible with good health; that its supposed stimulating aperient effect is not needed, that its *antiseptic* properties are unimportant, and that, although it assists in the absorption of fat, it is not absolutely necessary for that purpose, and that bile, in short, is chiefly excrementitious.† These conclusions are, perhaps, a little too absolute to be based on one observation, for the opposite conclusions, that the absence of bile from the bowel does lead frequently, directly or indirectly, to constipation, to putrefactive decomposition and flatulence, and to disordered digestion and assimilation, are founded on a vast number of observations by a variety of skilled observers.

Certainly, in the practical management of cases of jaundice, we shall have to consider these possibilities. It is desirable, therefore, in these chronic cases, to give simple kinds of food that can be readily assimilated, and that will not leave much residue to undergo putrefactive changes. Milk and light farinaceous foods, with small quantities of the more delicate kinds of fish and chicken, are permissible; but all excess must be carefully avoided, and fatty and saccharine foods prohibited. We have already pointed out the importance of the free exhibition of alkaline beverages when the stomach is empty. To correct intestinal acidity, it is best to give an insoluble alkaline carbonate, such as magnesia, once or twice daily—half a teaspoonful of light magnesia may be given at bed-time every night in a wineglassful of warm water.

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* Hare's "System of Practical Therapeutics" (new edition), vol. ii., p. 462.

† "Gall-stones and their Treatment."

That the absence of bile from the intestine does, in many cases, lead to morbid putrefactive changes in its contents we are satisfied. In order to avoid these changes, various remedies are available, and their employment will usually be found to be attended with great benefit to the patient. A capsule, containing a minim of creasote, or a grain of thymol made into a pill with a little powdered soap and rectified spirit, may be taken after each meal; either of these will be found most valuable in checking the intestinal putrefaction. Bouchard recommends charcoal upon which an ethereal solution of iodoform has been poured. The ether evaporates rapidly, and a mixture of charcoal and iodoform remains; this is an exceedingly disagreeable remedy, which we do not consider more efficacious than the preceding. He has also suggested naphthaline and naphthol. By this means he succeeds in rapidly removing the fœtor of the motions. Inspissated ox-gall (*fel bovinum purificatum*) has been given with advantage in these cases to supply artificially the aperient, digestive, and anti-putrefactive properties of the absent bile. But to be of use it must be *quite fresh*, and 10 grains of this may be given in pills an hour or two after food three times a day. It is best to coat these pills with a coating (such as keratin) soluble in the duodenum, but not in the acid contents of the stomach.

Creasote will be found a useful remedy also when diarrhœa is excited by the acid or putrefying intestinal contents. Whitla recommends large doses of turpentine in capsules for the relief of this symptom, taken when the stomach is empty, so that it may pass through into the intestine and exert its antiseptic action there. Salicylate of bismuth, charcoal, and boric acid have all been found useful for the same purpose.

We have already insisted on the necessity of administering aperients regularly in all forms of jaundice associated with constipation. It must, however, be borne in mind that in *chronic* jaundice from obstruction there is no indication for so-called hepatic stimulants or *cholagogues,* but rather for such saline or other aperients as will unload the portal circulation, relieve any hepatic engorgement, and remove the pressure on the distended bile ducts. An aloetic and soap pill at night, and a draught containing sodium or magnesium sulphate the following morning, will be found one of the best aperients to use in these cases.

In the next place there are certain symptoms, dependent on the presence of bile *in the blood,* which require to be considered; one of the most troublesome is an intense **itching** of the skin. Warm baths or vapour baths, together with friction of the skin while in the baths with alkaline (sodium) soaps, is one of the best means of relieving this symptom. Sponging with weak carbolic lotion has been found useful. Warm diaphoretic drinks, together with vapour baths, so as to promote free excretion from the skin, should be given. *Pilocarpine* has been advocated as a most efficient remedy for this symptom, given hypodermically, in doses varying from $\frac{1}{12}$th to $\frac{1}{6}$th of a grain; indeed, Witkowski, whose statement is quoted, and in part approved, by Professor Whitla, has maintained that this is *the* remedy for all cases of simple hepatogenous jaundice. He injects $\frac{1}{8}$th of a grain once or twice daily. It is hardly necessary to point out that chill of the skin should be carefully guarded against by wearing thoroughly warm clothing.

Other symptoms dependent on the presence of the colouring matter of the bile in the blood are depression of the circulation, as indicated by slowing of the pulse rate, and a tendency to hæmorrhages, as well as great depression also of the intellectual functions, with drowsiness and hypochondriasis. To relieve these we must promote the natural efforts at elimination, mainly carried on by the kidneys, but which may be aided by stimulating the respiratory functions.

Frerichs insisted on the importance of increasing or maintaining the activity of the respiratory functions for the purpose of promoting the oxidation and destruction of the bile pigment, and for this purpose, when the patient is able to do so, we should encourage him to take much exercise in the open air, and to combine with this such gymnastic exercises as are within his strength and competence. It is our business also to favour the eliminative action of the kidneys. One of the best diuretics for this purpose is an abundance of pure water, or milk largely diluted with warm water, or whey may be advantageously used if milk shows any signs of disagreeing. Vichy, Ems, or Apollinaris water may be largely given, mixed with warm milk or whey. Potassium iodide, combined with potassium bicarbonate, 5 to 10 grains of each in a wineglassful of warm milk and water, may be given as a diuretic thrice a day. Imperial drink—or effervescing lemonade, made with lemon-juice and potassium bicarbonate—may be freely given.

Great circulatory and mental depression may require the use of tonics and stimulants. Digitalis has been suggested, but its administration is rarely appropriate. Quinine and strychnine, combined with ammonia or with nitro-hydrochloric acid, according to circumstances, will be found the best tonics. The light effervescing wines (champagne, hock, moselle) often act freely as diuretics when diluted with some alkaline table water, and may be found useful in raising the forces of the patient when they are greatly depressed. Travel and the distractions it affords have been thought useful in warding off the mental and physical depression so distressing in protracted cases.

In cases of obstructive jaundice from organic stricture of the duct, or from pressure on it by malignant or other tumours, the remedies mentioned here can, obviously, only be palliative in their effects. In some of these cases surgical operation may be of use, as we have pointed out when dealing with the treatment of obstruction from impacted calculus.

We, in the next place, come to the consideration of those forms of jaundice which are **not due to obstruction.*** It is in these cases especially that jaundice must be regarded as symptomatic and as presenting no particular claim, of itself, to therapeutic measures. It is frequently only one out of many morbid phenomena presented by the disease in which it appears. The obscurity and uncertainty which surround its mode of origin render it futile to seek for causal indications for treatment. Jaundice is the prominent symptom in the rare disease known as *acute yellow atrophy* of the liver, which is characterised anatomically by extensive necrosis of the liver cells. This disease is almost invariably fatal, and for that reason it is also named "malignant jaundice." Its mode of origin is unknown, and no remedies that we know of are capable of influencing its course. Jaundice is also a symptom in many forms of *toxhæmia*, as in yellow fever, in malarial conditions, in some cases of typhoid, remittent and relapsing fevers, in some forms of pneumonia, in pyæmia, in cases of snake-bite, in phosphorus, and sometimes in ether and chloroform poisoning. Except in acute yellow atrophy the skin in these cases is rarely so darkly stained as in obstructive jaundice; moreover, the stools are not pale or clay-coloured, they may even be very dark; and the urine, in many of these cases, may contain but little bile pigment, although the urinary pigments are often greatly increased.

There is no special treatment that can be directed to the symptom of jaundice alone in these forms.

There is also a *jaundice of new-born children*—not the mere yellow discoloration of the skin often observed for a few days after birth, and dependent on the intense congestion of the skin during the first few hours of life, but a true jaundice, with staining of the conjunctivæ and skin with bile pigment, attended by the passage of bile-stained urine. There is a *benign* form which is very common, and will often get well without any treatment. The most that is necessary to hasten the disappearance of the jaundice is a mild aperient with a little sodium bicarbonate; $\frac{1}{20}$th of a grain of calomel or $\frac{1}{2}$ a grain of grey powder, with 2 or 3 grains of sodium bicarbonate, may be given twice or thrice daily. There is also a *grave* form which is rare, and may be due to congenital obliteration of the gall-ducts or to septic infection through the umbilicus (umbilical phlebitis). The poison may be derived from the maternal passages. These cases are almost invariably fatal; the proper treatment is that which would be applicable to other septic states.

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* The reader is referred to Dr. Wm. Hunter's article on "Jaundice" in Clifford Allbutt's "System of Medicine" (vol. iv.), for an elaborate analysis of the various views of pathologists on this form of jaundice.

ADDITIONAL FORMULÆ.

Pills to promote flow of bile in catarrhal jaundice.

℞ Extracti aloes, ʒss.
Sodii bicarbonatis, ʒj.
Extracti taraxaci, q.s.

Ut f. pil. lx. (To be kept in lycopodium powder.) Two night and morning.

(*Bamberger.*)

Or,

℞ Extracti aloes aquosi, ʒj.
Extracti rhei compositæ, ʒss.
Extracti taraxaci, q.s.

Ut f. pil. lx. Three pills night and morning.

(*Bamberger.*)

Mixture in jaundice.

℞ Succi taraxaci, ℥ij.
Sodii bicarbonatis, ʒvj.
Tincturæ rhei, ʒvj.
Infusi gentianæ ad ℥xij.

M. f. mist. A tablespoonful three times a day. (*Whitla.*)

Pills in catarrhal jaundice.

℞ Felis bovini purificati, ʒj.
Manganesii sulphatis exsiccatæ, gr. xl.
Resinæ podophylli, gr. v.

M. et divide in pil. xx. One three times a day.

(*Bartholow.*)

For the pyæmic jaundice of the new-born.

℞ Quininæ sulphatis, gr. jss. ad iij.
Acidi sulphurici diluti, ♏iij.
Syrupi aurantii, ʒijss.
Aquæ destillatæ ad ℥ijss.

M. f. mist. A teaspoonful every two hours. (*Widerhofer.*)

For acute catarrhal jaundice.

℞ Liquoris ammonii acetatis, ℥v.
Spiritus ætheris nitrosi, ℥j.
Tincturæ radicis aconiti, ♏x.

M. A tablespoonful every three hours in half a tumblerful of lemonade or Apollinaris. (*Engel.*)

Pills in malarial jaundice.

℞ Quininæ sulphatis, gr. xl.
Ferri sulphatis exsiccatæ, gr. xx.
Acidi arseniosi, gr. j.

M. et divide in pil. xx. One three times a day. (*Bartholow.*)

Aperient pills in jaundice.

℞ Aloes socotrinæ, gr. xv.
Gambogiæ, gr. xv.
Hydrargyri subchloridi, gr. xv.
Syrupi, q.s.

M. et divide in pil. x. One or two a week to keep the bowels loose. (*Gubler.*)

CHAPTER III.

THE TREATMENT OF CONGESTIVE AND INFLAMMATORY AFFECTIONS OF THE LIVER. 1. HYPERÆMIC CONDITIONS. 2. ACUTE SUPPURATIVE HEPATITIS, ABSCESS OF LIVER. 3. CHRONIC INTERSTITIAL HEPATITIS, CIRRHOSIS.

1. *Hyperæmic Conditions of the Liver.*—Causes of Active Congestion—"Free Living"—"Liver-chills"—Malaria—Gout—Suppression of Habitual Discharges—Symptoms—*Indications for Treatment*—Diet and Regimen—Counter-irritation—Aperients—Alkaline Effervescents. *Treatment* of Chronic Cases—Value of Courses of Mineral Waters and Hydrotherapy. Passive Congestion—Causes—*Treatment.*
2. *Acute Suppurative Hepatitis, Abscess of Liver*—Causes of Multiple Abscesses—No special Therapeutic Indications—Tropical Hepatic Abscess—Etiology. Symptoms—Pyrexia—Pain—Swelling—Fluctuation—Characteristic Aspect—Results. *Treatment*—Ipecacuanha, Morphine, etc.—Preliminary Puncture and Aspiration—Free Incision and Drainage—Modes of Procedure.
3. *Chronic Interstitial Hepatitis, Cirrhosis.*—Its Nature—Causes—Alcohol, etc.—Varieties—Hypertrophic or Biliary Cirrhosis. Symptoms of ordinary Atrophic Cirrhosis—Gastro-intestinal Catarrh—Hæmatemesis—Ascites—Slight Jaundice—Hæmorrhoids—Toxic Symptoms. *Indications for Treatment*—Diet—Milk—Aperients—Courses of Mineral Waters—Alkalies—Intestinal Antiseptics—Nitro-hydrochloric Acid—Treatment of Hæmatemesis and Ascites—Propriety of Tapping—Mode of Operation—Diuretics and Purgatives—Potassium Iodide—Ammonium Chloride—Tonics—Treatment of Varieties. Additional Formulæ.

1. Hyperæmic Conditions of the Liver.

Congestion of the liver is a term of very frequent use, but its signification is not always very definite and precise. It doubtless is often assumed to exist when it does not, and it is offered as an explanation of certain vague dyspeptic and other symptoms, without any positive evidence, from physical examination, of the existence of a morbid state of the liver.

It would, however, be a serious error to ignore the frequent existence of temporary as well as chronic morbid congestions of the liver, simply because this term is so vaguely, and often inaccurately, employed.

Hyperæmic conditions of the liver may be either (*a*) *active*, or *fluxionary*, or (*b*) *passive* or *congestive*; and we commonly speak of these states as *active* or *passive* congestion.

The amount of blood in the liver varies considerably within physiological limits, and there is a transient congestion of this organ after each meal. Rapid absorption by the portal vessels raises the lateral pressure in the portal venous system and causes a *fluxion* to the liver. Habitual excessive indulgence in food and drink may, and doubtless does, intensify this fluxion and produces active hyperæmia or congestion of the liver which, in course of time, leads to functional disturbances of this organ. The excessive consumption of alcohol, especially in the form of ardent spirits, is well known to lead to serious organic changes in the liver, as we shall presently see; but short of these serious organic changes, the habitual free use of alcoholic stimulants, together with a liberal consumption of food, is especially prone to induce such conditions of active congestion of the liver as we are now considering. One of the effects of the alcohol conveyed to the liver by the portal veins is no doubt to cause dilatation of its capillaries, and so to contribute directly to hyperæmia of this organ. Frequently recurring hyperæmias will naturally lead, in course of time, to permanent dilatation of the vessels.

Occasional over-indulgence in food and drink may lead to temporary congestion of the liver, of no great consequence, but habitual over-indulgence may lead to more permanent hyperæmia, which may require more serious consideration. It is clear that what is called "free living" tends to maintain active hepatic congestion.

It has been the custom of late years to speak of **"liver-chill,"** a condition which we should be disposed to place under the head of active febrile congestion of the liver, and which would appear to be capable of being produced by exposure to chill in certain other favouring circumstances, one of the chief of which would seem to be over-work and anxiety, and perhaps the possession of what is called a gouty constitution. In such circumstances, in certain constitutions, evidences of hepatic engorgement occur, with some enlargement and tenderness of that organ; this is usually accompanied by a moderate rise of temperature, and is often associated with symptoms of gastro-intestinal catarrh, and not rarely with slight jaundice, viz. bile-tinted conjunctivæ, pale motions and high-coloured urine, headache, languor, and physical and mental prostration.

We must add, then, exposure to cold in certain circumstances, to the causes of active hepatic congestion.

It is possible that the chronic hyperæmic conditions of the liver, which arise so commonly in Europeans who have to reside in tropical countries, may be closely allied to those states of "liver-chill" which occur in Great Britain, and may be, in part, dependent on chill supervening after exposure to great heat. But it is usual to regard these morbid states of the liver, arising in tropical countries, as dependent on exposure to malarial or other toxic influences.

Certain constitutional states, as the gouty and rheumatic, but especially the former, are generally admitted to predispose to attacks of active congestion of the liver. Prof. Bouchard has stated that he has observed dilatation of the stomach to be always accompanied by congestion of the liver, which he regards as produced by the passage into the portal veins of toxic substances derived from the abnormal decomposition of the contents of the dilated stomach. Active congestion of the liver has also been observed to follow the suppression of the menstrual flow or that of a hæmorrhoidal flux.

The **symptoms** of active congestion of the liver are sometimes those which we have mentioned under "liver-chill," but in other instances, and especially in the chronic forms, they usually consist of a sense of fulness or weight or constriction in the hepatic region, with pain or tenderness over the liver, where it escapes from the protection of the ribs, as will be found by percussion and palpation. There is also pain under the right shoulder, and often there are present the symptoms of chronic gastric catarrh, such as pain and fulness after food, flatulent distension, loss of appetite, a coated tongue, constipation (sometimes slight diarrhœa), high-coloured urine depositing lithates, headache, lowness of spirits and general malaise.

The **indications for treatment** in most cases of active hyperæmia of the liver are tolerably clear, and when thoroughly and honestly carried out, prove highly remedial.

The first and most important is to correct all errors of **diet** and faulty habits of life. The over-fed, indolent person must be made to take less food and more exercise. Those prone to indulge in alcoholic stimulants must be induced to forego this indulgence, and to be content with other beverages. When over-work and too close application to business or public affairs are at the root of the evil, rest and change must be insisted upon. Courses of mineral waters at Continental spas are, as we shall presently see, most useful in many of these cases, and they are not only useful in themselves, but they are also of great value from the necessity they involve of change and rest from habitual occupations. In the *febrile* cases, the cases of "liver-chill," the indication is to relieve the hepatic engorgement and the gastric catarrh usually associated therewith by a few days' *rest* in bed, by light, unirritating food, by counter-irritation, and by unirritating aperients and alkalies.

Counter-irritation over the region of the liver is undoubtedly of great value—the application of leeches, advised by some, we do not consider called for except in very exceptional cases—a large hot linseed and mustard poultice all over the right hypochondrium and the epigastric region will often be found of great service to the patient, and, when removed, should be succeeded by a thick layer of warm cotton-wool. The food should consist at first almost exclusively of fluids—milk and Apollinaris water, thin gruel, water arrowroot, light mutton or veal broth, a little light clear soup, weak tea with milk. After the feverish symptoms have passed away, some boiled fish (sole or whiting), and chicken and rice, or white game, or similar light food may be prescribed.

The hepatic congestion will certainly be favourably affected by draining, as it were, fluid from the portal vessels by means of suitable aperients, which will also at the same time unload the bile channels; for this purpose we should give a small dose of calomel, half a grain or a grain, at night (euonymin or iridin may be preferred for some persons), and a saline aperient draught the following morning—1 to 2 drams of sodium sulphate or magnesium sulphate, with 20 grains of sodium bicarbonate, in 2 ounces of warm water; or, with delicate persons who require a very mild and pleasant aperient, we may order 3 ounces of Dinneford's fluid magnesia, with a teaspoonful of lemon juice. During the day, an hour or half an hour before each meal, an effervescing saline dose, with a considerable excess of alkali, will be grateful and most useful to the patient. It relieves the tendency to nausea, allays thirst and "heat of stomach," and promotes the flow of thin bile into the intestine. The following is a good form:—

℞ Sodii bicarbonatis ... ... ʒiij.
Ammonii carbonatis ... ... ʒss.
Aquæ ... ... ad ℥vj.
Misce, fiat mistura alkalina.

℞ Acidi citrici ... ... ʒiss.
Syrupi limonis ... ... ʒvj.
Aquæ ... ... ad ℥vj.

Misce, fiat mistura acida. Two tablespoonfuls of each mixture to be mixed together and drunk while effervescing an hour before each meal.

If the hepatic congestion is associated with suppression of the menstrual flow, leeches to the os uteri and the application of cupping glasses or mustard poultice to the inside of the thighs have been advocated; and if dependent on the arrest of a hæmorrhoidal flux, leeches may be applied to the anus; but cases of this kind are rarely encountered.

For the **chronic** cases a different plan of treatment will be required. Instead of rest, free exercise in the open air, when possible, should be almost invariably urged. A careful, spare dietary should be insisted upon. Counter-irritation over the hepatic region may still be useful.

Regular and free action of the bowels by means of aperients will usually be necessary and beneficial. A euonymin (2 grains), aloes (1½ grain), and ipecacuanha (½ grain) pill at night, followed by one or two teaspoonfuls of Carlsbad or Homburg salts, in half a glass of hot water, the following morning, will be found efficacious in most cases.

But it is in these cases of chronic congestion of the liver that spa treatment proves so useful. A considerable choice may be afforded, and a selection made according to individual peculiarities or needs. Carlsbad, Marienbad, Kissingen, Tarasp, Brides, Vichy, Harrogate, Leamington, may prove efficacious in suitable cases.

Hydrotherapeutic treatment has also proved of great service, especially in malarial cases and in cases dependent on excesses in food or drink.

Passive hyperæmia or **congestion** of the liver is a common consequence of all those morbid states of the heart or lungs, or other intrathoracic disease, which lead to stasis of blood in the right side of the heart; and, owing to the very feeble lateral blood-pressure in the hepatic veins, only a slight obstruction is necessary in order to lead to more or less passive engorgement of the liver. Congestion of the liver is a usual consequence, and a regular feature in the clinical course of chronic valvular cardiac disease, of advanced emphysema of pulmonary fibrosis, and of any condition of the lungs or the thoracic contents which interferes with the free outflow of blood from the right side of the heart. The term "cardiac liver" is one in common use to express that state of chronic passive hyperæmia of the liver, and the structural changes it leads to, as a consequence of cardiac disease; and the familiar term "nutmeg liver" is applied to the appearances presented on sections of such a liver *post mortem.*

The liver may enlarge very considerably from hyperæmia of this kind, and the liver dulness may reach to the umbilicus or even below it. It is in circumstances such as these that "hepatic pulsation" may sometimes be detected, the whole organ throbbing at each cardiac contraction from the backward flow of blood into the hepatic veins.

We have already called attention to the symptoms attending this condition, and the treatment indicated, when dealing with the subject of chronic mitral valve disease, of which it forms a part:—the gastro-intestinal catarrh, the occasional hæmatemesis, the occurrence of ascites and general dropsy, the slight jaundice, the pale motions, and the high-coloured scanty urine containing biliary pigment.

In remediable cases, cardiac tonics, such as digitalis, together with rest in bed, may remove the hepatic engorgement by remedying the cause on which it depends. The value of free purgation we have repeatedly insisted upon to relieve the congestion of the abdominal veins. The food must be nourishing but light, and predigested or very digestible, and small in quantity.

In cases of intense hyperæmia it has been suggested that the liver should be punctured, and 18 or 20 ounces of blood withdrawn by aspiration. No doubt this measure might reduce, temporarily, the size of the liver, but in most of the conditions which lead to hepatic congestion of this extent the loss of blood is badly borne, and the benefit derived would be only of very brief duration.

2. ACUTE SUPPURATIVE HEPATITIS, ABSCESS OF LIVER.

Suppurative inflammation of the liver is met with in two forms: (1) *Septic* and *pyæmic* abscesses, and (2) the *large solitary* and *tropical abscess.*

The first form is almost invariably multiple except in some traumatic cases, when a large solitary abscess may sometimes be met with; they are always the result of septic, microbic, infective inflammation. They are prone to occur in cases of general pyæmia, and especially in conditions of *portal* pyæmia, when suppurative disease occurs in the region of the portal vessels, as in dysentery, typhlitis, appendicitis, ulcerative colitis, anal fistula, gastric ulcer, etc.

Multiple hepatic abscesses may also occur in connection with suppuration of the bile ducts from impacted calculus (*infective cholaugitis*); the treatment of this form is purely surgical.* When multiple infective abscesses are found, as they often are, within the branches of the portal vein, this condition is known as *suppurative pylephlebitis.* In these cases there is uniform enlargement of the liver, which is tender on pressure; there is pyrexia, which runs an irregular course, as in pyæmic jaundice; the complexion is muddy, and often bile-tinted. There are no clinical distinctions between pyæmic abscesses and suppurative pylephlebitis, their symptoms and features are those of pyæmia, with the addition of an enlarged and painful liver and a sub-icteroid hue of the skin. There is *no special treatment* of this state apart from that of the general or local infective disease from which it arises. Surgical interference is generally useless, as these cases almost invariably end fatally, but there could be no objection to puncturing an abscess which pointed externally.

Having dismissed these cases of multiple septic hepatic abscesses, we will now consider the more interesting subject, from a therapeutic point of view, of the treatment of the **large "solitary" tropical hepatic abscess.** Tropical abscesses are not, however, always solitary, although they frequently are so; nor are solitary large abscesses of the liver (so-called *primary* hepatic abscess) confined exclusively to tropical countries. They are very common, no doubt, in hot climates, but they do occur, though rarely, in England and other regions outside the tropics, but in temperate climates abscess of the liver is invariably *secondary*.

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* *See* Mayo Robson's "Diseases of the Gall-Bladder and Bile Ducts" (second edition), p. 52.

It has been debated whether abscess of the liver, even when it occurs in tropical countries, is ever really "*primary*," whether, in short, it is not always due to secondary infection from dysenteric ulceration, or some other infective condition in the intestinal canal. That it very frequently follows or is associated with dysentery is universally admitted. Many medical men, however, who have had extensive experience in India, believe that abscess of the liver may develop "*idiopathically*," and it seems to be agreed that cases certainly do occur without a history of previous dysentery, and that fatal cases have been met with where there has been no discoverable affection of the large intestine.

In the interesting researches on amœbic dysentery of Councilman and Lafleur,* it is suggested that the *amœbæ coli* (which they consider to have been proved to be the causative and characteristic organism of tropical dysentery) are carried to the liver by the portal vein and there produce dysenteric abscesses. "Of themselves the amœbæ can only produce a certain amount of injury by tearing the capillaries, the agents which produce the abscesses being the (pyogenic) bacteria which are carried within the bodies of the amœbæ from the intestinal canal to the liver."

These amœbæ have been found in abundance in the stools of dysenteric patients, also in the dysenteric ulcers, and abundantly in the pus of hepatic abscesses, and in the sputum in those cases where a hepatic abscess has opened into the lung. These observers examined the pus in four liver abscesses in cases where there was *no* dysentery, and they did not find any amœbæ. Three of the cases recovered after operation, and in the fourth, fatal case, an ulcer was found in the rectum. "Whether," they add, "the three patients who recovered were suffering from latent dysentery or not must remain a matter of conjecture."

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* "The Johns Hopkins Hospital *Reports*." Baltimore. Vol. ii., Nos. 7, 8, 9.

In reported cases of tropical hepatic abscess *without* intestinal lesions, no search being made for amœbæ, it is impossible to say whether they were present or not. "If they all are produced by the amœbæ, it is possible that they enter the liver without producing any intestinal lesions."* Further researches are needed and will doubtless be made in this direction.

Cases of hepatic abscess, as observed in Great Britain, usually occur in persons who have returned from a residence in the tropics, or who have contracted dysentery in India; instances are, however, on record of typical dysenteric abscess in patients who have never been out of England.

The **symptoms** of hepatic abscess are sometimes *latent*, and instances are recorded of sudden death from rupture of hepatic abscess, the existence of which was not suspected: usually, however, this disease is accompanied by a characteristic group of symptoms and physical signs.

Pyrexia, of an irregular, intermittent, septic type, usually exists. The temperature, after being normal or sub-normal for two or three days, will rise, with a rigor, to 103° Fahr., or higher; or there may be a daily afternoon rise, without rigor. Profuse perspirations are common. These symptoms sometimes lead to the disease being regarded as malaria. There is *pain* of a dull, aching character in the right hypochondrium, extending to the shoulder, and there is tenderness on pressure over the liver. Enlargement of the liver can usually be made out, most marked, however, in the majority of cases, in the right lobe and extending upward, and to the right, as the abscess cavity is more commonly nearer the upper than the under surface.

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* Councilman and Lafleur.

If the liver enlargement is great, as it often is, the right side may be considerably bulged, and the edge of the liver may be felt 3 or 4 inches below the costal margin. Fluctuation may sometimes be detected. Sometimes adhesions form, and the abscess points below the ribs, in the epigastrium. The peculiar aspect of the patient is considered to be suggestive, if not characteristic, of hepatic abscess: the face is pale, the complexion muddy, the skin sallow or with a subjaundiced hue, the conjunctivæ are swollen and bile-tinged. If diarrhœa is present, the stools should be examined for amœbæ.

It is not very uncommon for the abscess to rupture into the pleura. Sometimes it invades the lung, "the extension may occur through the diaphragm, without actual rupture and with the production of a purulent pleurisy and invasion of the lung," attended by severe convulsive cough and reddish-brown expectoration of a brick-dust colour, resembling anchovy sauce, in which *amœbæ coli* have been found, identical with those in the liver abscess and the stools. They displayed active amœbic movements.*

An abscess of the liver may also rupture into the peritoneum or pericardium and be immediately fatal, or into the stomach, duodenum, or colon, and the pus be vomited or discharged by the bowel. The most favourable results seem to follow spontaneous discharge through the lung, and next through the stomach and intestine.

The **treatment** of abscess of the liver must be mainly surgical. Many Anglo-Indian physicians describe forms of acute hepatitis, in what has been termed the pre-suppurative stage, a pathological condition which has not been recognised in England,

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* Osler's "Principles and Practice of Medicine" (fourth edition), p. 580.

and they maintain that such cases, with symptoms precisely like those of hepatic abscess, often recover quickly, under the exhibition of ipecacuanha in doses of 15 to 20 grains every five, six, or eight hours, while, at the same time, morphine is administered hypodermically to relieve the pain, and hot fomentations and poultices are applied locally. It has been remarked with regard to this statement, that it is impossible to be certain that suppuration would have occurred in these cases if left to themselves, but it may be said, on the other hand, that assuming ipecacuanha to contain a principle which has the power of destroying the activity of the *amœbæ coli*, and supposing this principle to be soluble in the intestinal contents and to be carried to the liver through precisely the same channels as the toxic irritant, and supposing this irritant to be of only feeble virulence, there seems nothing irrational or impossible in the hypothesis that its infective potency may be stayed, and the pathological processes which might otherwise end in suppuration abated.

But when the diagnosis is clearly established of the existence of hepatic abscess, operative procedures should at once be undertaken. In order, however, to make this diagnosis certain, preliminary exploratory or aspiratory punctures are usually needful. Such explorations, when made with care and caution, even should no abscess be found, so far from being injurious, have actually proved beneficial and remedial. Godlee, however, appears to think that this operation is not altogether a trivial one, and not free from danger of serious hæmorrhage. It is best to combine aspiration with puncture, for sometimes the pus is so thick that, without aspiration, it will not flow through the cannula. Sometimes the abscess is found to point distinctly in the right hypochondriac or the epigastric region, then adhesions between the liver and parietal peritoneum will almost certainly have taken place, and preliminary aspiration may be immediately followed by free incision and drainage.

Since hepatic abscesses have been treated by free incision and drainage, the mortality, according to Dujardin-Beaumetz, has fallen from 80 to 32 per cent.

There exists some difference of opinion as to the propriety of first attempting to cure the abscess by aspiration only. Fagge and Whitla both quote instances of the cure of hepatic abscesses after simple aspiration and withdrawal of the purulent contents. Godlee,* however, and most other surgeons, consider that if pus has been discovered, "the best plan is to give exit to it at once, by making a hole large enough to admit the finger, and afterwards a drainage-tube of the same size." He mentions that if the abscess points prominently, and if the skin be reddened, adhesions will almost certainly exist, but it is best not to assume this, and "if the incision is to be made in front, to cut down very cautiously through the abdominal wall, and to ascertain the state of the case." Should there be no adhesions, "a series of stitches through the parietal peritoneum, and pretty deeply into the substance of the liver," should be made, in order to secure adhesions. "If the abscess be pointing in the side," in order to avoid the pleura the incision should be not more than 2 inches above the margin of the ribs in the mid-axillary line. "If the pleura be opened it will be necessary to stitch the diaphragm to the costal pleura." A flanged tube, such as that used for empyema, the size of the finger and three or more inches in length, so as to go well into the cavity, should be introduced. The tube should not be taken out till the discharge has almost stopped. The dressings must be antiseptic: carbolic gauze, or Lister's cyanide of mercury gauze may be used. They must be extensive, and if the discharge be copious they will require changing in a few hours. When the abscess is deep-seated and much liver tissue has to be incised, free hæmorrhage is likely to occur. The wound must then be plugged by the finger for a minute or two, and if this does not arrest it, a plug of antiseptic material must be left in the wound for a day or two. For opening deep liver abscesses Godlee describes "a trocar, either sharp or blunt, which, as well as the corresponding cannula, is grooved upon one side. This is to be plunged into the abscess, and then a fine pair of dressing forceps is to be run along the groove, and the track is to be widened by expanding the blades; or, if thought safe, a bistoury may be employed for the purpose."

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* "Lectures on the Surgical Aspects of Hepatic Abscess," *British Medical Journal*, January, 1890.

Some surgeons do not think it desirable to wait for the formation of adhesions;* others are greatly opposed to this "rapid" method, and consider the best means of avoiding infection of the peritoneum is preventive suture of the liver to the abdominal wall.

The best results are obtained in cases of single abscess situated near the surface and not complicated with dysentery. "If the abscess have burst into lung, pleura, pericardium, or kidney, and the position of the abscess can be clearly determined, it must be opened without delay. If the existence of an abscess be only suspected, and the patient be losing ground, it is right to puncture the liver in the most likely situations, bearing in mind that, though usually quite harmless, a slight amount of risk accompanies this very trivial operation. . . . If, on the other hand, whether the abscess have ruptured or not, there are no means of diagnosing the whereabouts of the matter, and the patient be not losing or even gaining ground, the surgeon should hold his hand for a time" (*Godlee*).

3. CHRONIC INTERSTITIAL HEPATITIS, CIRRHOSIS, GRANULAR OR "HOB-NAILED" LIVER.

This is a form of chronic or subacute hepatitis affecting the smaller branches of the portal vein and the surrounding connective tissue, and resulting in a considerable proliferation of this tissue by production of young connective tissue elements from those already existing. Subsequently this new connective tissue undergoes cicatricial retraction, so that the proper gland structure of the liver becomes strangulated and in part destroyed. In this contraction and strangulation the branches of the portal vein become obstructed and to some extent obliterated, and the bile ducts also to a certain degree, and a considerable portion of the liver cells atrophy and disappear.

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* *See* article by Prof. Swain, *Practitioner*, November, 1900, p. 538.

Essentially then, in its most typical form, this disease consists in an irritative or inflammatory overgrowth of connective tissue, which, in the contraction it afterwards undergoes, obstructs the portal circulation and destroys the liver cells. In this typical so-called *atrophic* form the liver often becomes greatly diminished in size, firm, hard, fibrous, and resistant, but in very many cases and in the early stage of all cases the liver is usually increased in size. On section "the substance is seen to be made up of greenish-yellow islands, surrounded by greyish-white connective tissue." The name "cirrhosis" was given to this disease by Laennec, on account of this yellow colour seen on section.

This form of interstitial inflammation appears to be usually caused by the passage into the blood of the portal vein of some irritant, which is carried to the liver and there sets up an irritation and proliferation of the connective tissue, which ultimately leads to the development, as we shall see, of most serious and often fatal changes.

This irritant, according to general experience, is most commonly **alcohol.** And pure spirit, not much diluted and taken without food, is most prone to lead to this disease; hence another name given to it, viz. "gin-" or "spirit-drinker's liver." The fusel oil in ardent spirits is believed to be the irritating element.*

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* Lancereaux has made certain observations which have led him to believe that in France, at any rate, the chief agent in the production of cirrhosis is the potassium sulphite used in the "plastering" of wines. *Bull. de l'Acad. de Méd.*, September 7th, 1897.

Other substances may, possibly, have the same effect, such as rich, highly-seasoned food, or the absorption of ptomaines or other animal alkaloids from the alimentary canal.

It occurs far more frequently in males than in females, and in middle- and after-life than in youth. Its occasional occurrence in childhood has been advanced in proof of the existence of a non-alcoholic form, but many of these cases can also be traced to alcohol or some other irritating ingesta; a few, however, appear to be traceable to an acute interstitial hepatitis, set up by scarlet fever or other infective disease. Syphilitic and malarial forms are also recognised. We have already alluded to the hyperæmic "cardiac liver" which so frequently accompanies chronic heart disease; wasting of the central cells of the hepatic lobules, and hyperplasia of the connective tissue may occur in this form and so produce a cirrhotic condition.

Much attention has recently been directed to the fact that the liver is not diminished in size in all cases of cirrhosis. Even in the typical atrophic form there is moderate increase of size in the early stage, chiefly due to hyperæmia. There is also a form which has been described as "*fatty cirrhosis*," and this, according to Osler, is quite as common in America as the atrophic variety. The liver is "enlarged, smooth or very slightly granular, anæmic, yellowish-white in colour, and resembles an ordinary fatty liver. It is, however, firm, cuts with resistance, and microscopically shows a great increase in the connective tissue." It is most common in beer drinkers. The form associated with *perihepatitis* cannot be distinguished clinically from the atrophic form.

Much has been written on the subject of *Hypertrophic cirrhosis*, and this term has probably been applied to a variety of conditions; its clinical characters were first described by French writers, and especially by Hanot, and from its supposed origin about the bile ducts it has been termed *biliary* cirrhosis. It will be sufficient here to say that this form is characterised by permanent enlargement of the liver. The bile ducts are "the seat of the angiocholitis catarrhal and productive, and there is an extraordinary development of new biliary canaliculi," but the "histological details have not yet been worked out fully."* The surface, unlike that of the atrophic form, is smooth; "it is exceedingly firm, resists cutting, and presents on section a deep greenish-yellow colour." The chief clinical differences between the hypertrophic "biliary" and the atrophic form are that in the former there is *persistent jaundice*, which may be intense, although the stools are bile-stained; and there is an absence of *ascites*. It may run a very chronic course (4 to 6 or even 10 years), and is apt to terminate with the symptoms of acute febrile jaundice. "The patient may present every feature of acute yellow atrophy," the sole diagnostic criterion being the enlargement of the liver. Dieulafoy maintains that there are "mixed" cases, and that the two forms run into one another.

To return to the common type of so-called atrophic cirrhosis and its symptoms. These depend on the two essential elements of the disease: obstruction to the portal circulation and destruction of liver cells. It is remarkable that the most extreme degree of atrophic cirrhosis may occasionally exist without symptoms, owing to the establishment and maintenance of a collateral compensatory circulation of complete efficacy. This takes place through anastomosis between rootlets of the portal veins and those of the general venous system; between those of the æsophagus and stomach, and between the rectal and iliac veins; and much of the blood of the portal vein doubtless also gets into the veins of the abdominal wall, and through them into the internal mammary veins.

But the establishment of such a complete compensatory collateral circulation as this is extremely rare, and **symptoms**, due to engorgement of the tributaries of the portal vein, are prominent. The earliest to appear are those due to gastro-intestinal catarrh, to which the habit of spirit-drinking may have, directly as well as indirectly, contributed—a tremulous and furred tongue, nausea, and vomiting, especially on getting up in the morning, loss of appetite, flatulence, irritability of bowels, and sleeplessness. Congestion of the stomach often leads to hæmatemesis, which may be profuse and repeated. It is followed by melæna. The spleen is usually also enlarged from congestion. Greatly enlarged superficial veins may often be seen over the abdominal and lower thoracic regions. Ascites often supervenes, and with it some œdema of the feet, but general dropsy is rare. Slight jaundice may appear in a certain proportion of the cases, but it is more frequently absent. The urine is scanty, loaded with urates, and sometimes contains a little albumen. Hæmorrhoids are often present.

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* Osler's "Practice of Medicine" (fourth edition), p. 574.

A slight rise of temperature has been noted in some cases. The aspect of the patient is often characteristic; he is thin and ill-nourished, with watery conjunctivæ, sunken eyes, muddy icteroid complexion, and distended venules (stigmata) on the nose and cheeks. In the early stage the liver will be found enlarged and tender. When ascites is present it will be difficult to examine the liver, but after removal of the fluid the liver will be found diminished in size, and its surface hard, firm, and granular.

The preceding symptoms are due to portal obstruction. *Toxic* cerebral symptoms may also develop at any period, noisy delirium or stupor, coma and convulsions. What particular toxic agent produces these symptoms is as yet undetermined; they are analogous to those of uræmia arising in connection with renal disease, for which they have sometimes been mistaken.

Symptoms similar to these may appear in cases of *fatty cirrhotic* liver, but this form is more commonly latent and rarely directly fatal. These are the cases often diagnosed as "hypertrophic cirrhosis."

With this brief preliminary account of the nature, causation, and symptoms of hepatic cirrhosis before us, we may now be able to formulate some rational *indications* for its **treatment**. In the *first* place, there is the *causal indication*, *i.e.* the avoidance of all alcoholic or other irritating ingesta. *Secondly*, there is the indication to relieve the symptoms of co-existing gastro-intestinal catarrh, due in part to the same cause as the cirrhosis, viz. alcohol, and in part to the obstruction in the portal vessels. *Thirdly*, there is the indication to lessen the portal engorgement by whatsoever means we can safely employ for that purpose. *Fourthly*, there is the indication to relieve urgent symptoms that may arise, such as hæmatemesis and ascites. *Fifthly*, there is the indication to relieve blood contamination (toxic symptoms) arising from the interference with the excretory functions of the liver, caused by compression of the bile ducts and atrophy of the liver cells. And *sixthly* and lastly, there is the indication to endeavour to maintain the nutrition of the body and to support the strength of the patient in a disease in which both are gravely compromised. Let us now see how we are to fulfil these indications.

1. In the first place, the diet must be most strictly limited to such foods and beverages as are absolutely unirritating and easy of digestion and assimilation. Although it may be needful in *advanced* cases to give small quantities of dilute alcohol to maintain the patient's strength, in *early* and remediable cases all forms of alcohol should be entirely forbidden.

An *exclusive milk diet* has been advocated by many physicians as of the greatest value in arresting the progress of this disease. Whitla, in Ireland, has found butter-milk a most useful food. Without limiting the patient absolutely to milk we would strongly recommend that it should be made the chief article of diet, and in cases in which it is not well borne, if given pure and by itself, it should be mixed with an equal quantity of some alkaline water, such as Vichy, Vals, or Apollinaris; or, with patients who cannot afford these waters, 10 or 15 grains of sodium bicarbonate should be added to each tumblerful of warm or hot milk and water. Equal parts of milk and thin oatmeal gruel, hot or cold, is a very nourishing and pleasant drink. Or the milk may be boiled and thickened with arrowroot or isinglass, so that when cold it forms a jelly, and this may be eaten with a dry biscuit. Milk soup, made by adding to hot milk some well-cooked fresh vegetables and flavouring with celery salt, or some Spanish onion, or thickening with vermicelli or macaroni, is a good variation of the monotony of milk diet. Well-cooked, fresh vegetables and fruit may be allowed in moderation. All fats and saccharine foods should be forbidden, and animal food generally, if not wholly proscribed, should be reduced to a minimum, and the most delicate kinds alone permitted, such as a little boiled chicken, or boiled or grilled sole or whiting.

In advanced cases, where no hope of any great or permanent amelioration can be entertained, and where it is chiefly a question of maintaining the rapidly-diminishing strength of the patient, we may be obliged to give nourishing animal broths and jellies, and such stimulants as champagne or brandy with some effervescing water.

2. A diet such as has been indicated will contribute greatly to the relief of the symptoms of gastro-intestinal catarrh, which are amongst the earliest indications of the existence of this disease; but we have also medicinal measures at our service of no mean utility. One of the most serviceable is the regular depletion of the engorged portal vessels by suitable aperients. A pill of $\frac{1}{6}$th or $\frac{1}{8}$th of a grain of podophyllin (or 2 grains of *iridin*), with 1 to 2 grains of extract of aloes, a grain of soap, a little oil of peppermint or caraway, should be given every other

night, and 1, 2, or 3 drams, according to the sensitiveness of the patient to aperients, of Carlsbad salts, in half a tumblerful of hot water, should be given the first thing every morning. This, in the early stages, will relieve the hepatic congestion, and probably thereby arrest the progress of the disease, while, in more advanced cases, it unloads the abdominal veins, prevents or postpones the occurrence of hæmatemesis and ascites, sweeps away the decomposing residue of imperfect digestion, and so avoids blood contamination or distressing flatulent distension.

Much the same effects are produced by courses of mineral waters, such as the courses at Carlsbad, Marienbad, Kissingen, Tarasp, and Brides, and in some cases such milder courses as Vichy, Ems, or Neuenahr. Warm alkaline waters, such as these latter, undoubtedly exercise a favourable influence over the gastro-intestinal catarrh, but they are rarely so efficacious of themselves as the other alkaline and aperient springs named. At these spas the regular use of warm stimulating baths serves to maintain the cutaneous functions in activity; and the regular exercise in the open air, which forms part of the routine of this cure, is also most advantageous. It must, of course, be remembered that it is only in the treatment of the first stage of the disease that these mineral waters are applicable. The useful effects of alkalies in relieving the gastro-intestinal catarrh can be obtained at home, without the trouble of going to these spas.

The following dose may be ordered three or four times a day, about half an hour before taking food:—

℞ Sodii bicarbonatis	gr. xv.
Potassii bicarbonatis	gr. v.
Spiritus ammoniæ aromatici	ʒss.
Infusi aurantii compositæ (*vel* aquæ menthæ piperitæ)	ad ℥jss.

Misce, fiat dosis.

This dose may be usefully diluted with an equal quantity of hot water; this will assist in dissolving and washing away stringy mucus from the mucous membrane of the stomach. If there is pyrosis and morning vomiting of catarrhal secretion from the stomach, half a dram or a dram of the liquor bismuthi et ammonii citratis may, for a time, be added to each dose of the above mixture. If there is constant nausea, a dram of aqua laurocerasi should be added to each dose; or, should there be much gastric pain and irritability, 3 to 5 minims of liquor opii sedativus may be added instead. Symptoms of an excessive amount of intestinal decomposition, such as great flatulent distension, etc., will be best relieved by a pill containing half a minim of creasote or a grain of thymol, two or three times a day.

We are doubtful as to the existence of any special virtue in nitro-hydrochloric acid in the treatment of these cases; it has, however, been warmly advocated by Whitla, who attributes its frequent failure to produce any good effects to its liability to decomposition, and urges that it should be always freshly prepared. He uses it locally as well as internally. For the former purpose he applies a lotion, made by mixing ½ ounce of strong nitric acid and 1 ounce of hydrochloric acid with a gallon of warm water, on spongio-piline, to the whole of the hepatic region, until an eruption appears.

3. The treatment we have advocated for the relief of the gastro-intestinal catarrh, especially the *use of regular aperients*, will also apply to the third indication, viz. to lessen the portal engorgement. Counter-irritation to the hepatic region, by linseed and mustard poultices, and the abstraction of blood by applying leeches to the anus, have their advocates, and they may be useful in the early stages of hepatic engorgement; but free and regular purgation by non-irritating aperients, such as we have already described, is the most trustworthy measure.

4. The relief of such urgent symptoms as hæmatemesis, and those that arise from a great accumulation of ascitic fluid in the peritoneal cavity, of course

demand careful consideration. The management of cases of hæmatémesis has been fully considered in a former chapter (vol. i., p. 124). When it depends on portal obstruction, as in this disease, free purgation by the alkaline sulphates, given in combination with dilute sulphuric acid, should follow the other measures that have been recommended for the arrest of the bleeding.

With regard to the treatment of **ascites,** authoritative opinion is now much more in favour of early and repeated *tapping* than was formerly the case.

It used to be thought that the occurrence of ascites was the almost certain precursor of a fatal termination of the disease; and it was argued that as, in the great majority of such cases, the obstruction to the portal circulation was extreme and irremediable, and that as soon as the ascitic fluid had been removed by tapping it was certain to re-accumulate, we were only, as it were, bleeding the patient into his own peritoneal cavity, and so rapidly exhausting him, and thereby hastening the fatal event.

No doubt the majority of cases of hepatic cirrhosis, when they reach the stage of the appearance of ascites, are in a bad way; but in a considerable minority of such cases recovery takes place under suitable treatment; and until the effect of the operation has been tested it is difficult to determine whether or not the case is past remedy, while if it is past remedy, little harm can be done by paracentesis. In any case it seems to us better that the distressing pressure of the fluid accumulation, when very large, should be removed by this slight operation, than that the patient should be daily depleted by large doses of hydragogue cathartics; and diuretics, in very large accumulations, are generally useless, owing to the pressure of the ascitic fluid on the kidneys. One of Bristowe's cases recovered after fourteen tappings; and Whitla mentions a case that had been tapped fifty times and recovered. Dr. Cheadle * has protested strongly against the practice of attempting to carry off the fluid in ascites by the continued use of hydragogue cathartics. He maintains that they are ineffectual for this purpose, while they seriously reduce the strength and nutrition of the patient. He is also a strong advocate of *early* tapping as the most reliable means of affording relief and promoting recovery in cases where recovery is possible.

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* *Lancet*, vol. i., 1900, p. 1046, "Some Cirrhoses of the Liver."

The operation of **paracentesis abdominis,** although a very simple one, should be performed with care and caution. The patient should be first given a little stimulant, then the surface of the abdomen, where the puncture is to be made, should be washed with antiseptic fluid, the bladder should be emptied, the point where the trocar is to enter should be marked—the median line, midway between the umbilicus and the pubis, is that usually selected—avoiding, of course, any dilated superficial vein; if thought necessary, the spot selected may be rendered anæsthetic by ether spray, by a mixture of ice and salt, or by injecting under the skin a little strong solution of cocaine; a small incision with a scalpel or lancet should first be made through the skin, and then the trocar and cannula (which should be a moderately fine one, as there is certainly no advantage in a rapid removal of the fluid) quickly introduced; these instruments should, of course, be carefully cleansed, so as to be made perfectly aseptic. Before the operation a many-tailed (three or four tails) flannel bandage should be applied to the back, and the ends held by the assistant or nurse, ready to compress the abdomen from above downwards as the fluid escapes, and when the operation is completed the ends should be firmly fastened, and the bandage arranged so that uniform pressure may be maintained over the abdominal surface. It is often convenient to attach a long indiarubber tube to the cannula, so as to conduct the fluid, as it slowly flows away, to a vessel near the patient. If the patient should feel faint during the withdrawal of the fluid some more stimulant must be given. As much fluid should be withdrawn as possible, unless the patient shows any unfavourable symptom during its removal. After taking away the trocar, the wound in the skin should be pinched close by the finger and thumb, and some antiseptic cotton-wool and collodion applied.*

The use of **diuretics** and **purgatives,** which often fail to have any effect on the dropsical accumulation before paracentesis, may often be usefully applied after the operation, to further the complete removal of the ascitic fluid, and to prevent its rapid reaccumulation.

They may also be used in those cases where, for some reason or other, it is determined not to tap the patient. Besides relieving the engorgement of the portal vessels they also serve to diminish the toxhœmia, which is a serious element in this disease.

The purgative usually employed is sulphate of magnesia, in half-ounce doses, dissolved in as little water as possible, and given in the morning early, half an hour at least before breakfast; or compound jalap powder, in dram or dram-and-a-half doses, given with a little warm water at the same hour.

Certain diuretics are undoubtedly valuable, and favour the removal of the fluid. One of the most popular and useful is the well-known pill of digitalis, squills and mercury (a grain of blue-pill and of powdered digitalis and squill in each); one of these should be given twice daily. Some prefer ¼ grain of calomel in place of the blue-pill—indeed, calomel alone has been found a very efficient diuretic in many cases. A combination of calomel and caffeine, ½ grain of the former and 2 or 3 grains of the latter, has been found to be retained in the stomach when other drugs have been rejected, and to act well as diuretics. Various other diuretics have been employed in these cases; a favourite combination consists of a mixture containing 30 grains of potassium acetate, ½ dram of spirits of nitrous ether, ½ dram of spirits of juniper, and ½ ounce of infusion of digitalis, in each dose, which should be given thrice a day.

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* We have not discussed the recently proposed operative measures for the relief of ascites, which have for their object the production of adhesions between the liver and the surrounding peritoneum, with the idea that new vascular channels would form and the nutrition of the liver cells be improved, and the return of blood from the portal area aided. We regard these measures as useless and undoubtedly dangerous, as the reported cases certainly show (*see Transactions* of Medical Society of London, vol. xxiii., p. 63).

Resin of copaiba, in 15-grain doses, has been warmly advocated as a diuretic in hepatic ascites. It may be rubbed up with compound almond powder and water into an emulsion.

Limiting considerably the amount of fluid taken into the stomach has, in a few instances, been found to favour the disappearance of the ascitic fluid.

Iodide of potassium and chloride of ammonium have been highly lauded by some physicians in the treatment of hepatic cirrhosis, not so much as diuretics, but for some supposed special action. Arsenic has also been credited with some power in checking the process of degeneration of the hepatic cells. We doubt if ammonium chloride has any special action on this disease. Potassium iodide, however, appears to have some influence in checking the advance of sclerosing processes; it often acts powerfully as a diuretic, and as it is sometimes impossible to say whether or not the cirrhosis, or the ascites, may have a syphilitic origin, we think it advisable to try the effect of this drug, for a time, in most intractable cases; and it is as well, in order thoroughly to eliminate the possibility of syphilis, when we are in doubt, to combine with it small doses of perchloride of mercury.

In all these cases it is highly important to combine, with our other measures, a supporting tonic treatment. The appetite may be maintained or improved by some vegetable bitter, such as gentian, or nux vomica, or strychnine, given half an hour before meals. A light, nourishing dietary should be provided, and it may be necessary, in some advanced cases, to allow a small amount of wine or spirits well diluted. For the relief of diarrhœa, severe vomiting, and insomnia, symptoms which occasionally assume considerable prominence, formulæ will be found at the end of this chapter.

5. When **toxic** symptoms appear the disease is usually advanced, and little can be hoped from treatment. In the absence of diarrhœa, the effect of brisk purging may be tried, and the action of the skin should be promoted as in uræmic cases.

6. The maintenance of the strength of the patient, by supporting and tonic treatment, has already been insisted upon.

A few words remain to be said as to the treatment of certain varieties of hepatic cirrhosis.

In *biliary cirrhosis*, where there is obstruction of the bile ducts and marked jaundice, and usually no ascites, the indications for treatment do not differ greatly from those of the typical form. It is even less amenable to any but palliative measures. The bowels should be regulated by the aperient sulphates, such as Carlsbad and Marienbad salts; warm alkaline drinks, such as Vichy or Apollinaris water, should be given half an hour or an hour before food, and the diet should be light and simple.

Syphilitic cirrhosis, which may be met with in children and young adults from inherited syphilis, and which is occasionally associated with gummata in the transverse fissure compressing the portal vein, or the hepatic ducts, so as to give rise to jaundice or ascites, requires the administration of potassium iodide and mercury, as we have already pointed out.*

In so-called *malarial cirrhosis* the liver is usually enlarged, and the symptoms are somewhat indefinite, but jaundice is usually present. A course of Carlsbad or Vichy waters, or regular use of the alkaline and saline aperient salts derived from these springs, with an occasional mercurial or other cholagogue purge, should be prescribed. The use and application, as already described, of nitro-hydrochloric acid, is especially applicable to these cases. Arsenious acid ($\frac{1}{50}$th of a grain) in a pilule after each meal, continued for some time, is also of great use in attacking the malarial element.

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* Bristowe reported a remarkable instance of this form of ascites, in which all treatment failed until the syphilitic nature of the case was accidentally discovered (*British Medical Journal*, April 23rd, 1892).

In conclusion, we must remark that hepatic cirrhosis is a *remediable*, but not a *curable*, disease. As Osler well observes, "So far as we have any knowledge, no remedies at our disposal can alter or remove the cicatricial connective tissue which constitutes the *materia peccans* in ordinary cirrhosis. On the other hand, we know that extreme grades of contraction of the liver may persist for years without symptoms when the compensatory circulation exists. The so-called cure of cirrhosis means the re-establishment of this compensation."*

ADDITIONAL FORMULÆ.

Purgative pills in hepatic cirrhosis.

℞ Pulveris radicis rhei, ʒij.
Extracti aloes, gr. xxx.
Extracti colocynthidis, gr. vj.
Extracti rhei, q.s.

Ut f. pil. lx. Two to be taken twice a day. (*Bamberger.*)

Pills in hepatic cirrhosis.

℞ Podophyllin, gr. vj.
Capsici, gr. iv.
Pulveris rhei, gr. xxij.

M. et div. in pil. xij. One on alternate nights. (*Da Costa.*)

In early stage of hepatic cirrhosis.

℞ Sodii bicarbonatis, ℥ss.
Infusi gentianæ, ℥vj.

M. f. mist. A tablespoonful three times a day, between meals. (*Da Costa.*)

Pills in chronic hepatitis.

℞ Extracti taraxaci, gr. xxxvj.
Extracti aloes, gr. xij.
Extracti colchici acetici, gr. vj.
Pulveris ipecacuanhæ, gr. vj.

M. et div. in pil. xij. Two every night. (*Martin.*)

In hepatic congestion.

℞ Ammonii chloridi puri, ℥ss.
Aquæ menthæ piperitæ, ℥iij.

M. f. mist. A dessertspoonful three times a day. (*Murchison.*)

Mixture in hepatic cirrhosis.

℞ Acidi nitro-hydrochlorici diluti, ℥ss.
Extracti taraxaci liquidi, ℥ij.
Tincturæ nucis vomicæ, ʒvijss.
Extracti cinchonæ liquidi, ʒiv.
Infusi chiratæ ad ℥xij.

M. f. mist. A tablespoonful in a wineglassful of water to be taken four times a day before food. (*Whitla.*)

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* "Practice of Medicine" (fourth edition), p. 576.

Diuretic pill and mixture.

℞ Pulveris scillæ, gr. jss.
Pulveris digitalis, gr. ss.
Pilulæ hydrargyri, gr. ij.
M. f. pil. To be taken two or three times a day.

℞ Potassii acetatis, gr. xx.
Spiritus ætheris nitrosi, ʒss.
Decocti scoparii ad ℥jss.
M. f. haust. To be given with each dose of the above pills. (*Murchison.*)

For severe diarrhœa.

℞ Bismuthi carbonatis, gr. xv.
Magnesii carbonatis, gr. x.
Tincturæ cinnamomi, ʒs.
Mucilaginis, ʒj.
Aquæ, ad ℥j.
M. f. haustus. To be taken occasionally when the diarrhœa is urgent.

For severe vomiting.

℞ Spiritus ammoniæ aromatici, ♏xv.
Aquæ laurocerasi, ʒi.
Spiritus chloroformi, ♏xv.
Aquæ, ad ℥j.
M. f. haustus. To be taken occasionally to allay vomiting.

For insomnia.

℞ Chloral hydrate, gr. x.
Sodii bromidi, gr. xv.
Tincturæ lupuli, ʒss.
Aquæ chloroformi, ℥j.
M. f. haustus. To be taken at bed-time.

To check hepatic degeneration.

℞ Liquoris arsenicalis, ♏iii.
Ferri tartarati, gr. v.
Potassii bicarbonatis, gr. x.
Aquæ chloroformi, ad ℥j.
M. f. haustus. To be taken three times a day. (*Bruce.*)

CHAPTER IV.

THE TREATMENT OF HYDATID CYSTS OF THE LIVER.

Origin, Nature, and Development of Hydatid Cysts—The *Tænia echinococcus*—Prophylactic Measures—Characters of Hydatid Fluid—Symptoms often Absent, sometimes Obscure—Possible Results—Spontaneous Cure—Suppuration with Pyæmia—Rupture. *Treatment*—(1) by Internal Medication—Potassium Iodide, etc. (2) Simple or Electro-puncture—Urticarial Rashes after Puncture. (3) Tapping with Aspiration—Different Opinions as to its Safety—Aspiration with Hypodermic Syringe. (4) Injection of Medicinal Substances. (5) Abdominal Section, Free Incision and Drainage—Advantages of this Method.

A globular painless tumour in the hepatic region is generally a hydatid cyst. A hydatid cyst is not, strictly speaking, a *disease of the liver*, as it may and does occur in other organs, but clinically its consideration is not unnaturally associated with that of enlargements of this organ, and its treatment may therefore be now conveniently considered. A hydatid cyst in this situation may attain a great size without giving rise to any complaint, and it has not unfrequently happened that the presence of such a cyst has only been discovered when some accidental circumstance has led to its rupture.

In order to consider the subject from the point of view of prophylaxis, as well as of cure, it will be needful to refer briefly to the origin and nature of these remarkable cysts.

A hydatid cyst represents a phase in the singular life-history of a very small tapeworm, the **Tænia echinococcus,** found in the intestine of the dog. This tapeworm, when fully grown, only measures $\frac{1}{6}$th of an inch in length, and consists of but three or four segments, the last segment containing the sexual organs, and in this the vastly numerous ova are developed and pass out of the dog's intestine with the fæces; they are thus liable to get into any open watercourse, or to be deposited on the leaves or stalks of fresh vegetables. Should this ovum reach the human stomach its shell is dissolved by the gastric juice, and the liberated embryo, by means of six small hooks with which it is provided, bores its way through the walls of the stomach or intestine and most commonly gets conveyed to the liver, probably by penetrating into one of the tributaries of the portal vein and being carried onwards by the portal blood stream until it is arrested in one of the portal capillaries; hence it finds its way into the hepatic tissue. Here the hooklets disappear, and the embryo is gradually converted into a small cyst. It grows larger and becomes converted into a vesicle containing a transparent fluid. Besides its own proper capsule, it becomes enclosed (probably by irritation of surrounding tissue) with a distinct investing membrane of vascular connective tissue. This outer capsule grows with the hydatid. The subsequent development of the hydatid is of some practical importance. From the interior of the parent or "mother cyst," usually a number of buds or smaller cysts develop; these, at first attached by a pedicle, are afterwards set free and are termed "daughter cysts," and within them "granddaughter cysts" may develop in the same manner; so that the parent cyst may become filled with a vast number of smaller cysts of various sizes. Subsequently the interior of the parent cyst develops buds, which, instead of forming detached vesicles, remain connected with it and form *scolices* or *heads*, provided with suckers and hooklets, and these, if they reach the intestine of a suitable host, are capable of growing into tæniæ.

So far, then, as prophylaxis in the human subject is concerned, the chief measure is to avoid all drinking water or food substances that can by any possibility have become contaminated with the excrement of dogs. This is especially important in countries such as Iceland and in some parts of Australia, where this parasite is known to abound in the intestines of these animals. In some countries it is extremely rare, as in America; it is said to be common in London dogs (*Fagge*), but as there are practically no open water-courses in London from which drinking water is derived, it must be from allowing dogs to live in the same apartments, and in great intimacy, with human beings, that the latter become affected, doubtless by the pollution of some articles of food.

In Iceland, owing to the great number of dogs there (equal to nearly one-third of the population), and the domestic intimacy permitted them, this disease is so common that it has been estimated to be present in from a tenth to a thirteenth of the entire population. In Australia, also, where dogs are employed in great numbers for herding sheep, this malady is common. The sheep are the hosts of the larval form, and as their intestines, after slaughter, are commonly given to the dogs to eat, the circle of infection is maintained.

The temptation to drink, in such countries, from a running stream or from a spring that is open to possible contamination, should be resisted, and the risks attendant thereon should be pointed out to peasants, soldiers, workmen, travellers, and others who are especially exposed to this temptation. Boiling, or filtering through a charcoal filter, will render such water safe.

The fluid of a hydatid cyst is clear and limpid, of a specific gravity of 1,005 to 1,009. It does not contain albumen, and is not rendered cloudy by heat or nitric acid. It contains traces of sodium carbonate and chloride, and it is said occasionally of sugar. When this fluid is withdrawn by puncture, scolices or *echinococci* can often be found floating in it or deposited from it, or hooklets may be found in the deposit, either being diagnostic of the nature of the fluid.

Symptoms, as we have already said, are sometimes entirely absent, even in the case of large cysts—this, of course, depends on their situation. Sometimes the cyst forms a distinct globular tumour in the epigastric region, or it may protrude the ribs and intercostal spaces in the right hypochondrium, or appear below the costal arch; or it may project from the upper surface of the right lobe of the liver and encroach on the pleura and lung, and give rise to a peculiar arched area of dulness in the lower and back part of the chest on the right side; or it may be more deeply seated, and then it may give rise to symptoms of some obscurity. If the cyst is superficial it can usually be recognised by its smooth, rounded form, its tense, firm feel, and sometimes by fluctuation. The so-called *hydatid fremitus* is often absent, and must not be regarded as of much significance. Some weight and dragging, and sometimes pain in the hepatic region, are associated with large cysts.

The presence of other symptoms may be determined by the *result* of the disease: (1) The hydatid may die, the cyst then diminishes in size, the capsule thickens, shrinks, and becomes calcified, and the contents dry up into a putty-like mass and there is *spontaneous cure.* (2) The cyst may *suppurate*, and pyæmic symptoms may appear, rigors, sweatings, emaciation, and more or less jaundice, and the surface of the tumour may become hot, tender, painful, and red, and it may sometimes be difficult to distinguish it from a hepatic abscess. (3) The cyst may *rupture*, before or after suppurating, into any of the surrounding parts, or externally; rupture into the peritoneum is usually quickly fatal; into the pericardium or into the vena cava is immediately fatal; into the bile ducts causes intense jaundice, and is almost invariably fatal; into the stomach, colon, pleura, or bronchi may be attended by recovery; the last event is the most favourable.

The **treatment** suitable to hydatid cysts of the liver must depend somewhat on their size, their situation, and the presence or absence of signs of suppuration of the cyst. Small cysts, not exceeding a small orange in size, not showing any tendency to increase, and not giving rise to any pain or inconvenience, may be left alone with a fair prospect of their undergoing spontaneous cure; for it must be borne in mind that dangerous symptoms have been occasionally observed to follow every kind of operation for the cure of hydatid cysts of the abdomen. Some authorities point to the serious symptoms which may follow aspiration or puncture, and advocate free incision and drainage; and others point to the fact that a mortality of more than 10 per cent. has been reported after abdominal section for hepatic hydatids.*

The several measures that have been advocated for the treatment of hydatid cysts of the liver are the following:—

1. Internal medication. 2. Simple or electro-puncture. 3. Tapping, with or without aspiration. 4. Injection of medicinal substances into the cyst. 5. Abdominal section, free incision, drainage and irrigation.

1. *Internal medication* is now generally discredited. Kamala, sodium chloride, and potassium iodide have been advocated; the last-named drug has been spoken favourably of by Professor Jaccoud and by Semmola. Semmola maintained that he had demonstrated the presence of iodine in the fluid of the hydatid cyst in certain cases, after the exhibition of potassium iodide. After a few days of treatment with the iodide he withdrew some of the liquid by aspiration, and if he found iodine in it he continued the treatment, and obtained a reduction in the size of the tumour and its conversion into a solid mass; if, on the contrary, he failed to find iodine in the fluid aspirated, he adopted another method of treatment. An obvious source of fallacy here is that simple puncture and withdrawal of even a small quantity of fluid will suffice, of itself, to effect a cure in many cases.

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* Whitla mentions ("Dictionary of Treatment") that Gardner lost five out of 47 cases of abdominal incision for hepatic hydatids.

2. *Simple* or *electro-puncture* was found by Fagge to be a most effectual means of curing some forms of hydatid tumour. He believed that the application of the galvanic current was not an essential part of the process, but that the simple insertion into the cysts of one or two slender gilt needles (with antiseptic precautions, of course), which were left there for ten minutes and then carefully withdrawn, sufficed for the cure.

This treatment is only applicable to hydatids of moderate size and that are quite superficial. Fagge believed that in these cases the death of the parasite was due to an escape of some of the hydatid fluid into the peritoneal cavity, and this belief was founded on the observation that in some instances fluctuation could be detected in the lower part of the abdominal cavity a few hours after electrolysis, and that an *urticarial rash* appeared a day or two afterwards. Such a symptom has often been observed to follow the absorption of hydatid fluid, and is believed to be caused by some toxic substance contained in it.

3. *Tapping*, together with *aspiration*, is a suitable and safe measure with hydatid cysts of moderate size and superficially situated.

If a fine capillary trocar and cannula be used, if antiseptic precautions be carefully observed, if great care and caution be taken in their introduction and removal, and if the aspirating suction be not too strong, we believe this to be a perfectly safe measure. Some difference of opinion, however, exists amongst authorities as to the safety and suitability of this practice. Fagge thinks aspiration inapplicable, and possibly injurious, if the cyst is enclosed in the liver. "To exert forcible suction," he says, "by an aspirator upon a cyst surrounded by solid tissue must involve some risk." But there seems to be no reason whatever for using "*forcible* suction"; a slight suction-force should be sufficient to withdraw a *portion* of the fluid, and that, according to Fagge, is all that is necessary "to ensure the ultimate disappearance of the tumour."

Dujardin-Beaumetz, however, urged as an important precaution, "that all the fluid should be withdrawn from the cyst," and that the "aspiration should be as complete as possible."*

If we are disposed to trust to the withdrawal of a *small portion* of the fluid in order to effect a cure, a very useful instrument for the purpose is a syringe, made precisely like a hypodermic syringe only much larger, to hold at least an ounce of fluid, and it should be furnished with a needle about twice as stout and three or four times as long as the hypodermic needle. This is a very handy instrument for exploratory punctures, and in a small or moderate-sized hydatid cyst, two punctures (which would give no more pain than the two needle punctures advised by Fagge) cautiously made, and the withdrawal of two ounces of fluid, if it did not suffice to kill the parasite, as it might do, would, at any rate, inform us as to the nature of the fluid, and if by chance the cyst had suppurated we should know that it was necessary to resort immediately to other measures. So that we should prefer aspiration of this modified kind to acupuncture

After tapping or aspiration the cyst sometimes, within a few weeks, increases in size, and if it be again tapped, the fluid removed will be found to be cloudy and to contain albumen. It is believed by some that this is due to the effusion of serum within the capsule; others say it is due to the death of the *echinococci*, and their solution: "they abandon to the fluid the albuminous matter of which they are formed."

At any rate, this increase in size of the cyst should not lead us to conclude that a repetition of the aspiration is needed. It is rather an indication of changes associated with the death of the parasite, and in course of time the tumour will again diminish in size and finally disappear. Fagge laid it down as a rule that no second operation on a hydatid cyst should be performed within twelve months, unless there was some reason to think suppuration had taken place.

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* This author also insisted that a capillary trocar and cannula, the piercing-point of which can be withdrawn, is much safer than a pointed needle, which may wound the wall of the cyst, and cause hæmorrhage.

4. The injection of medicinal substances into the cyst, such as iodine, ox-gall, male-fern, etc., is not usually a commendable expedient; but Bacieli * speaks highly of a method of treating hydatid cysts by injecting into the cyst (after the withdrawal of 20 cubic centimetres of the fluid) 20 grammes of a solution of corrosive sublimate 1 in 1,000. In about five days, he says, the patient is cured, the parasite is dead, and the symptoms surely recede.

5. Finally, we come to the method which is now most generally approved of in dealing with all the more serious forms of this disease, viz. **abdominal section, free incision, and evacuation** of the cyst by drainage and irrigation. This is the only method suitable to the treatment of suppurating cysts, and it is the best also in the case of all cysts of large size. The advantages of this method are obvious; by incision into the abdominal cavity the surgeon is able to see what he is dealing with, and to ascertain the position and relation of the tumour. It has been truly said that when a needle is plunged into the region where a hydatid cyst is situated, it is like "striking in the dark." He is also able to discover whether adhesions do or do not exist, and if they do not exist, by stitching the wall of the cyst to the parietal peritoneum and to the abdominal wall he is able to open the cyst freely without any fear of the escape of any of its contents into the abdominal cavity; and further, by making a free opening in the cyst, he is able to explore it with his finger, and to promote its complete and aseptic evacuation. For full descriptive details of this operation we must refer to works on Practical Surgery.

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* International Congress at Rome, 1894.

Part VI.

URINARY AND RENAL AFFECTIONS.

CHAPTER I.

THE TREATMENT OF MORBID STATES OF THE URINE.

Variations in Characters of Urine consistent with Health.

LITHIASIS.—Deposit of *Amorphous Urates;* its significance—Deposit of *Uric Acid;* its causation—*Treatment* of Uric Acid Deposits; *Preventive and Remedial*—Food and Food Habits—Alkalies—Water-drinking—Utility of Mineral Springs—Aperients—Exercise, Baths, and Frictions.

OXALURIA.—Mode of Origin of *Oxalates* in Urine—Relation to Dyspeptic States and to the Formation of Calculi—*Indications for Treatment*—Dietetic, Hygienic, Medicinal.

PHOSPHATURIA.—Deposit of *Amorphous Phosphate of Lime;* its significance—Treatment of habitually alkaline Urine—Deposit of *Triple Phosphate* in decomposing Urines—Relation to Vesical Calculus—Causation—*Bacterial* Agency—Relation to *Cystitis*—*Indications for Treatment.*

HÆMATURIA.—Etiology—Sometimes Endemic and Parasitic—Seat of Hæmorrhage—*Treatment*—Indications—Rest, Bland Drinks, Astringents—Ergotin, etc.

HÆMOGLOBINURIA.—Characters of the Urine—Different Forms—*Paroxysmal* Form—Causation—*Treatment*—Protection from Chill—Drugs—*Toxic* Form.

CHYLURIA.—Origin—Prophylaxis—Treatment.

ALBUMINURIA.—As a Symptom of various Diseases—In "apparently Healthy" Persons—Conditions under which it occurs—*Treatment.* Additional Formulæ.

WE shall consider the subject of the **treatment** of urinary and renal affections under two principal divisions: 1. The treatment of morbid states of the urine, together with that of renal calculi; and 2. The treatment of congestive and inflammatory diseases of the kidneys. We shall, however, reserve the consideration of the treatment of diabetes until we deal with the subject of constitutional diseases.

Many morbid states of the urine cannot be regarded as, in any sense, *local* diseases, but rather as expressions of constitutional morbid conditions, and so entirely is this the case with regard to one common pathological state of the urinary secretion, viz. *glycosuria*, that, as we have already said, we do not propose to consider it in this Part. Yet in many of these the symptoms complained of, as well as certain of the pathological changes induced, are manifestly local, and we are only following a universally accepted classification in considering them as amongst urinary and renal diseases.

It should be borne in mind, in considering whether any particular specimen of urine is morbid or not, that, in different individuals, very great differences may be encountered in the amount of *water* secreted in the urine, so that its specific gravity may vary within very wide limits, from 1005 to 1030, consistently with health; and with this great variability in the amount of water secreted in the urine there will be corresponding variations in the colour and in the capability of retaining in solution the urinary solids. A urine of high specific gravity (unless this depends on the presence of sugar) will be of darker colour, and more likely to deposit urates on cooling, than a urine of lower density. Persons who perspire freely and lose much water by the skin, especially if they are in the habit of drinking sparingly of water, will often pass urine very dark in colour and of high specific gravity, and we should inquire into these habits before concluding that the urine is morbid. Those, on the other hand, who perspire but little and drink freely of water or aërated waters, or of diuretic beverages, such as tea and coffee, will usually habitually pass an abundant quantity of pale urine of low specific gravity.

LITHIASIS; THE DEPOSITION OF URIC (OR LITHIC) ACID AND URATES IN THE URINE.

The deposition of *amorphous* **urates** is one of the commonest of occurrences in urine after it has been voided and on cooling. Its occasional occurrence is not inconsistent with perfect health, and may be determined simply by an unusually low temperature, or by active or severe exercise, or by excessive perspiration. It also frequently occurs in association with a variety of morbid states—some trivial, some grave, as in common colds or chills, in some dyspeptic conditions, in fevers, and in most wasting diseases. In fevers this deposition may be in part due to the excessive loss of water by the skin and lungs, owing to the high temperature and the quickened circulation.

The urine must always be *acid* for this deposition to take place. It only appears as the urine cools, and it again disappears on warming the urine. It is usually more or less deeply coloured by urinary pigment, but pale, almost colourless, urates are occasionally met with.

The amorphous urates, as found in human urine, are, as Sir William Roberts's investigations have shown, *quadri-urates.* This is the special physiological combination of uric acid. When uric acid departs from this normal state of combination it is apt to give rise to morbid phenomena. *Free uric acid* is only met with in the human body as a *morbid* product, as a crystalline deposit in the urine, and as gravel and calculus in the urinary passages. *Bi-urates* are also pathological products; they occur as so-called "gouty" concretions in the tissues, and their history will be considered in treating of gout.

These quadri-urates are very unstable. "In weak solutions of the alkaline carbonates or of the dimetallic phosphates they slowly take up an additional atom of base and are converted into bi-urates. On the other hand, in water, and in watery solutions of the neutral salts, they are split up into free uric acid and bi-urate."* Uric acid is extremely insoluble,† and when, in certain circumstances, the quadri-urates (of potash, soda, and ammonia) in human urine become decomposed in the urinary passages and uric acid is set free, it is deposited in the crystalline form, and thus may give rise to the symptoms of gravel. This tendency may not in other cases be shown until after the urine is voided, when a copious deposit of characteristic crystals of uric acid takes place.*

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* Sir W. Roberts, "Uric Acid, Gravel, and Gout," p. 30.

† A gramme requires for its solution at ordinary temperatures 14 litres of water, and about half that amount at the temperature of the body.

It may be of some importance to note that "all acid urines, if guarded against septic changes, deposit uric acid sooner or later," and if it were not for the presence of some inhibitory ingredients, which greatly retard the water of the urine from breaking up the quadri-urates, "uric acid would be thrown out daily in the urinary passages, and everyone would be subject to gravel." It would appear that the salts and the pigments are the chief of these inhibitory ingredients.

The preceding observations may assist us in elucidating the **etiology** of **uric-acid** gravel.

An undue poverty of the food in *saline* constituents may predispose to the precipitation of uric acid in the urinary passages. The comparative frequency of stone amongst the children of the poorer classes may thus be traced to their food, consisting chiefly of substances poor in mineral salts—as is the case with farinaceous substances—bread, oatmeal, and potatoes; whereas milk, meat, and fish, which enter so much more largely into the dietary of the children of the well-to-do, contain a far greater proportion of mineral salts. Stone is also very common in India, where rice forms the chief part of the diet of the natives—a food very poor in mineral constituents—and then the urine must also necessarily be poor in saline substances. The freedom from gravel and stone which sailors are known to enjoy has been referred to the great quantity of salt they consume with their food. The tendency to precipitation of uric acid in chronic Bright's disease may be referred to the almost entire absence of pigment in the pale urine of low density passed in this disease.

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* These crystals look like grains of cayenne pepper; they are usually in the form of rhombs or prisms of a deep red colour, owing to staining with urinary pigments.

In another class of cases in which uric acid deposits are common, *i.e.* in the over-fed, rich, and indolent, the urine abounds in salts and in colouring matter, and another cause must be sought to explain this tendency; no doubt in these cases the precipitation is due to the excessive acidity of the urine and to the excessive quantity of uric acid in it. It has been experimentally established that the higher the percentage of uric acid in urine (out of the body) the more rapidly is the uric acid precipitated, and it has also been shown that the addition of a very minute quantity of an alkaline carbonate to normally acid urine postpones considerably the deposit of uric acid.

Sir Wm. Roberts's experiments justify the conclusion that "high acidity, poverty in salines, low pigmentation, and high percentage of uric acid" tend to accelerate the precipitation of uric acid, and that "depressed acidity, richness in salines, richness in pigments, and low percentage of uric acid" tend to retard precipitation. The most important of these factors appears to be the degree of acidity.

The **treatment** of uric acid deposits may be either preventive or curative. Much may be done by medicinal and hygienic treatment to limit the tendency to the deposition of uric acid in the urinary passages. But it is important not to associate too intimately the occurrence of uratic deposits in the urine with gout, as is sometimes done.

Sir William Roberts has well pointed out that although the two tendencies are often found together, they are also often found separately, and that while in gout the precipitation is believed to take place in the blood and tissues, and the uric acid is deposited in the form of a chemical combination—sodium bi-urate; in gravel the precipitation takes place, strictly speaking, outside the economy, in an excretion—the urine—

while it is certainly still *in contact* with the urinary passages, and the uric acid is deposited in the *free*, not in a combined, state.

These tendencies own, undoubtedly, a close relationship, but they are not exactly identical; it is, however, quite possible that the same constitutional vice, modified by some other controlling influence which we do not understand, in the individual, determines in one a precipitation of free uric acid in the urine, and in another a deposit of sodium bi-urate in the tissues. It is remarkable that in districts where calculous disorders are common, gout is of rare occurrence, and conversely, where gout is common calculous disorders may be infrequent.

These considerations are important from the point of view of therapeutics, as, in the case of uric acid gravel, it is to modifying the urinary excretion that our attention should, in a special manner, be directed.

As it has been shown that a deficiency of saline matters in the urine favours the tendency to deposition of uric acid, we should endeavour to supply this deficiency by suitably modifying the food of persons with this tendency. The free admixture of common salt with the food is one means of accomplishing this, and when the habitual food is found to be composed of substances poor in salines—as rice, potatoes, and farinaceous foods generally—we should endeavour to replace them by others rich in salts—as animal flesh, fish, eggs, milk, and fresh vegetables.

Although in certain circumstances and in certain cases precipitation of uric acid may occur in urine which contains *less* than the normal average of this ingredient, such an accident is of rare occurrence, and we may assume, as a basis for our therapeutic injunctions, that an excessive amount and a high percentage of uric acid in the urine, when other favouring conditions co-exist, greatly increase the tendency to the production of gravel. When such a condition of the urinary excretion exists some attempts should be made, by modification of the diet, to alter it.

It has been experimentally established that a reduction in the amount of albuminoids in the food is attended by a diminution in the excretion of uric acid, and that an increase in the amount of albuminoids consumed is followed by an increase in the excretion of uric acid.* We should carefully inquire into the food habits of patients who suffer from uratic deposits, and we should limit the intake of animal albuminoids, such as butcher's-meat, game, the firmer and richer kinds of fish, eggs, cheese, etc., to the quantity actually necessary for the due nutrition of the body; as a fact, very many men, especially of the easy classes, consume an amount of animal albuminates largely in excess of the nutritive wants of the system, and this doubtless is one reason why they suffer so much more from this affection than temperate men of the labouring classes. Such persons should be urged to reduce the quantity of animal food which enters into their daily dietary, and replace it by consuming a larger proportion of farinaceous foods, of fresh vegetables and salads, and of fruit.

An **excessive acidity** of the urine is undoubtedly one of the most potent factors in causing the precipitation of uric acid, and our first and chief therapeutic effort should be to moderate or remove this excess. There is no more important fact to be borne in mind, in connection with this matter, than that *uric acid cannot be deposited from an alkaline urine*, and it cannot be deposited *prematurely* (*i.e. within* the urinary passages) even in urine that is neutral or feebly acid. In our endeavours to prevent this excess of acidity in the urine it may help us to remember certain facts that have been established with regard to this excretion. The taking of food lowers its acidity and augments its quantity; fasting has the opposite effect. It follows naturally that sleep has the same effect as fasting, and that it is followed by an increase in the acidity and a relative diminution in the amount of urine. It is therefore during sleep, and especially in the early morning, for an hour or two before breakfast, that there is the greatest risk of precipitation of uric acid in the urinary passages. During sleep many factors favour the deposition of uric acid; the urine secreted is relatively excessively acid, it is scanty, it is rich in urates, and owing to the complete repose of the body the renal stream is comparatively slow and stagnant. During the day opposite conditions prevail. Our protective measures then should be especially applied at bed-time, and in more intractable cases in the early morning also—or during the night if the patient is restless. These remedial indications are (1) to lessen the acidity of the urine and (2) to increase its dilution. In order to lessen the acidity of the urine, alkalies must be given. For this purpose we prefer a mixture of 15 grains each of sodium and potassium bicarbonate, together with 5 grains of sodium chloride, dissolved in a breakfast-cupful of warm milk and water, about one-third milk and two-thirds water. This dose may be taken at bed-time and on waking in the morning, and during the night if restless and wakeful. In slight cases, and merely as a preventive, one such dose daily will suffice; in more decided cases two, or even three, should be given. Some use potassium citrate in doses of 40 to 60 grains dissolved in 3 or 4 ounces of water. We think the bicarbonates more effective, as they also relieve excessive gastric acidity, which is often present in these cases.

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* In health the daily amount of uric acid excreted depends much on the diet. With a vegetable diet, half a gramme may be excreted; with an animal diet, as much as two grammes.

It is, however, better to use the citrate if we give the dose *soon after* food, as we do not then desire to neutralise the acid gastric juice.

The advantage of milk and water as a vehicle, together with the addition of a few grains of chloride of sodium, is that it makes the mixture quite a pleasant drink, taking away the alkaline taste, and that it is an efficient diuretic, and therefore promotes another most important indication, viz. the free dilution of the urine.

We have found a few grains of sodium bicarbonate, when dissolved in a cupful of hot milk and water, rapidly produce a considerable diuretic effect with many persons. In very intractable cases a drink of this kind should also be ordered to be taken about an hour before lunch and dinner, in addition to the above night and morning alkaline draughts. The reaction of the urine should be frequently tested, and the alkaline doses should be diminished as soon as it is found safe to do so.*

Persons predisposed to uric-acid gravel should not allow too long intervals to occur between their meals. The usual effect of a meal is to render the urine for a time alkaline and to dilute it in proportion to the quantity of water consumed; *after* assimilation the urine again becomes acid and more concentrated. At the same time it must be remembered that it would be a serious error to urge such persons, when they suffer also from languid and slow digestion, to take another meal before the preceding one has been digested; that might simply have the effect of producing an acid dyspepsia, which would greatly aggravate the tendency to uratic deposits. If a light breakfast is taken at 8.30 a.m., the mid-day meal should follow at 1.30, and the evening meal not later than 7.30, while at 12 noon, at 5 p.m., and at bed-time, a tumblerful of milk (one-third) and potash or Vichy water (two-thirds) should be drunk.† This plan we consider far preferable to *frequent* feeding.

The object of alkaline treatment is not necessarily to render the urine alkaline, but to sufficiently diminish its acidity that the precipitation of uric acid may not occur within the urinary passages, where it becomes a source of danger, but be postponed until after the urine has been voided, when no harm can follow its deposit.

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* A specimen of freshly-voided urine should be set aside in a test-tube, kept warm to prevent the deposition of amorphous urates, and if precipitation is morbidly imminent crystals of uric acid will soon appear; if they do not appear for several hours precipitation is not morbidly imminent, and the antacid medication may be moderated or discontinued (Sir W. Roberts, "Croonian Lectures").

† Ten grains of potassium bicarbonate in a tumblerful of milk (one-third) and water (two-thirds) will do quite as well.

Another useful preventive of uric acid precipitation is the habitual consumption of an adequate quantity of pure **water** or of beverages which substantially have the same diluting effect on the urine. Sir William Roberts has pointed out that this may occasionally be "a two-edged weapon," and by diminishing the degree of pigmentation and the proportion of salines in the urine it may certainly favour the deposition of uric acid. But we believe, and, indeed, Sir William Roberts admits, that such contingencies must be excessively rare; and we may conclude that, as a practical rule, the free consumption of pure water is altogether an advantage to persons subject to uratic deposits. It must not be trusted to alone, but, combined with the other means we have referred to, it is a valuable auxiliary.

Alkaline mineral springs, such as Vichy, which justly heads the list, Vals, Ems, Royat, Neuenahr, Apollinaris, etc., are of great value in the treatment of uric-acid gravel; they both dilute the urine and diminish its acidity, and, moreover, when drunk as they are at their sources in considerable quantity, they flush the urinary tracts and carry away concretions that may be already lodged there.

Of late years it has been the fashion to advocate the use of non-alkaline mineral waters in the treatment of uric-acid gravel, and altogether fanciful dangers attending the use of the alkaline springs * have been invoked or invented to enhance the reputation of those spas which have not the advantage of possessing such springs. Springs very feebly mineralised, such as *Evian*, or containing chiefly a little calcic sulphate, as those of *Contrexéville* and *Vittel*, in France, have been especially advocated. Undoubtedly uric acid concretions, even of considerable size, have been frequently found to be evacuated during and after a course of Contrexéville waters. In this resort *very large quantities* of the mineral springs are frequently prescribed, and we can scarcely doubt that it is mainly to the mechanical flushing of the urinary passages, by these large quantities of water, that the remedial effects are due.

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* Dujardin-Beaumetz, referring to this, observed that it was Trousseau who invented the "Alkaline Cachexia," and remarked that since that epoch the experimental method had shown that the alkalies promote and regulate nutrition rather than enfeeble the organism ("Clinique Thérapeutique," vol. ii., p. 226).

But, to quote again Sir William Roberts, "A preventive treatment should be available all the year round, and be capable of timely application whenever the emergency arises. I see no reason . . . . . why sufferers from this kind of gravel should not, by a prompt resort to antacid remedies, be able at all times to protect themselves effectually against fresh formation of uric acid concretions, and thereby save themselves from a world of pain and danger."*

A regular, free, daily evacuatión of the bowels is most important in these cases, for, by promoting hepatic and intestinal excretion, we lessen the risks of excessive elimination of acid urates in the urine. A mild aloetic pill at night, combined occasionally with half a grain of calomel and followed by a tumblerful of Carlsbad water in the morning, will be found most useful.

Regular, adequate exercise in the open air is advantageous, and should be recommended in most cases, with the view of promoting complete oxidation of nitrogenous waste into the soluble area. We are not, however, in favour of prescribing very active physical exercise in *all* cases indiscriminately, as we may, by so doing, cause in some persons an increase in the excretion of acid urates from excessive nitrogenous metabolism, and in persons who perspire freely we may also produce a dangerous concentration of the urinary excretion in the urinary passages.

The excretory functions of the skin should be promoted by regular baths and by friction of the surface.

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* "Croonian Lectures," 1892, p. 70.

If dyspeptic symptoms co-exist, these must be dealt with in accordance with the principles already laid down in another chapter; more especially a great simplicity and moderation in the diet must be enforced. Alcoholic stimulants should be, if possible, entirely abandoned, or limited to a small quantity of hock or other similar light wine mixed with an alkaline water.

The utility of certain of the recently introduced so-called "solvents" of uric acid we shall refer to in the next chapter, when dealing with the subject of the treatment of renal calculi.

OXALURIA.

This term is applied to the continued or frequent presence in the urine of crystals of **oxalate of lime.** Their usual form—that of small, colourless, octahedral crystals—is well known and characteristic; as is also their occasional appearance in what has been termed the "dumb-bell" form. It has been estimated that in health about a grain and a half of oxalate of lime is passed daily in the urine.

The mode of origin of the oxalates has not been clearly ascertained. It has been maintained that they are wholly due to oxalic acid introduced into the stomach in vegetable substances. The oxalates have been regarded by some French authors as the gravel of ill-nourished persons—the peasants and the poor who live almost entirely on vegetable food. They do not admit the existence of the so-called "oxalic diathesis," but look upon the appearance of oxalate of lime in the urine as altogether accidental. Esbach's researches show that a vast number of common articles of food contain oxalic acid. Sorrel, spinach, rhubarb are especially rich in it. It also occurs in cabbage, beetroot, haricots, tomatoes, celery, potatoes, and even bread; it is found in dry figs, in plums, gooseberries, strawberries, raspberries, oranges, lemons, and cherries; it is present in considerable quantity in pepper, in black tea, and in cocoa, and, in less quantity, in coffee and chocolate. Many other less common articles of food are mentioned as containing it in minute quantity. It seems, therefore, very probable that the poor, who live much on vegetable food and who drink large quantities of tea, may introduce an excess of oxalates with their food, and so determine the deposition of oxalate of lime in the urine.

Some have suggested that it is derived from uric acid by a process of oxidation; others that it originates from incomplete oxidation of starchy, saccharine, and fatty foods, of which, however, there seems to be no kind of proof; and others that it is due to changes in the mucus of the urinary passages, or to decomposition of uric acid by the action of certain ferments in the urine. Its appearance in the urine has been said to coincide with the development of a particular form of dyspepsia in ill-nourished, over-worked persons, accompanied by pain or weight across the loins, irritability of the bladder, great muscular languor, general debility, emaciation, nervousness, and great depression of spirits. But these symptoms are apt to occur in persons who show no evidences of oxaluria, while the latter may be found in persons unaccompanied by any of these symptoms. However, the chief clinical significance of excess of oxalates in the urine is the risk of the deposition of crystals of oxalate of lime in the urinary passages and the formation of calculus. The precipitation of crystals of oxalate of lime, *long after the urine has been passed*, is not necessarily of any pathological significance, and may be simply the result of decomposition in the urine.

It is, perhaps, of some practical importance to know that these crystals are most frequently found in highly acid urine. They are said to be usually abundant in cases of spermatorrhœa.

It will be seen that we have no very clear causal indications for **treatment** in these cases, except, it may be, to look carefully to the diet of such patients. Alimentary substances known to contain oxalic acid should be prohibited. The chief of these we have named. Tea should be especially avoided, and alcoholic drinks also. Milk appears to be well borne, and may be given freely. A nourishing diet, composed of an adequate quantity of animal food of digestible quality and suitable preparation, is an important point to be insisted upon. Cantani found that an exclusive meat diet freed the urine of oxalates.

Such general hygienic measures should also be enforced as are calculated to restore both mental and bodily health. Cold sponging, followed by friction of the skin, plenty of outdoor exercise, at the seaside or in mountain or country resorts, rest from fatiguing or exciting occupations, and, when possible, freedom from worry.

Co-existing dyspeptic conditions must be treated on the general principles already laid down. If there should be chronic gastro-intestinal catarrh, washing out the stomach daily has been advocated; or a substitute for this somewhat disagreeable process may be found in drinking three-quarters of a pint of hot water, containing 2 or 3 teaspoonfuls of Carlsbad salts dissolved in it, about an hour or half an hour before breakfast every morning, and a glass of Vichy or Apollinaris water at bed-time. Good results have followed, in some instances, the prolonged use of Contrexéville water, both at the spa itself and at home. It is usual at the spa to order such patients to drink about 2½ litres (4½ pints) of water daily. It is well to bear in mind that such large quantities of mineral waters are by no means well tolerated by feeble and debilitated persons.

The bowels should be kept freely open by suitable aperients. Nitro-hydrochloric acid seems to be one of the most useful medicines in this malady, and 20 minims of the dilute acid, mixed with some bitter infusion, may be given soon after food twice or thrice daily; we may often usefully combine with this 10 to 15 minims of tincture of nux vomica, or 3 or 4 minims of liquor strychninæ, or a grain or two of quinine may be added to each dose, or 5 to 10 grains of the citrate of iron and quinine. Although alkalies are not of the same use in these cases as in uric-acid gravel, still they are sometimes of service; and Sir William Roberts had seen good arise from small doses of potassium bicarbonate, and he had seen crystals of oxalate of lime disappear by rendering the urine freely alkaline; this is very likely to be the case where there is a mixed deposit of uric acid and oxalates. The main object of treatment is to restore the digestive and general tone.

PHOSPHATURIA.

There are two forms of phosphatic deposit which occur in *alkaline* urine. The first is of little clinical significance; it is a white deposit ("white gravel") of amorphous phosphate of lime thrown down when the alkalinity of the urine is due to *fixed* alkali; this precipitation, however, sometimes takes place in the bladder, and the phosphates are discharged at the end of micturition as a whitish fluid, which is sometimes mistaken for spermatorrhœa. Calcium phosphate is often precipitated on heating the urine of persons in health. It is distinguished by being dissolved by acetic acid. This form of phosphatic deposit very rarely leads to the formation of calculi, for the amorphous phosphate of lime has scarcely any tendency to form solid masses. It is not certain that the presence of this deposit in the urine ought to be regarded as evidence that it is excreted in excess. To prove that, it would be necessary to make a quantitative analysis of all the urine passed in twenty-four hours; nor is there any very direct evidence that *phosphatic* urine is a symptom of undue waste of the nervous tissues. However, we think there is some presumptive evidence to this effect. There are no *special* indications for the **treatment** of this form of urinary deposit: the morbid conditions, if any, with which it is found associated will present the true indications for treatment.

Habitually alkaline urine should be treated by general hygiènic measures, suitable food, change of air and scene, moderate regular exercise, and cheerful occupation. Mineral acids are of little direct value, but may assist usefully as general tonics.

It is different with regard to the phosphatic deposit determined in urine by *ammoniacal* fermentation of urea, as observed in cystitis, which appears to be due to the introduction of a **bacterial** ferment.

This is the *triple* or *ammonio-magnesian phosphate* found in decomposing urines. These phosphates are prone to concrete together and so form a considerable part of many calculi. Such calculi are usually formed in the bladder, and this deposit may even cover the mucous membrane of the bladder itself. The mode of entrance of the bacterial ferment into the bladder upon which this ammoniacal decomposition of urea depends is not always clear; it has undoubtedly been often introduced by the passage of catheters which are not clean and aseptic. Certainly stagnation of urine in the bladder favours this decomposition, and when once established, if the bladder cannot completely empty itself, there is always a residue of putrid urine to excite the same process in that afterwards secreted. If cystitis does not already exist, the presence of this ammoniacal urine in the bladder readily excites it, and pus becomes mixed with the excretion.

The *indications* for **treatment** in these cases are (1) to thoroughly cleanse the bladder of its decomposing contents and (2) to endeavour to prevent the further decomposition of the urine secreted.

(1) The bladder should be completely emptied of its contents by catheterisation when it is evident that micturition does not thoroughly empty it; but great care should always be taken, when introducing a catheter into the urethra or bladder for any purpose, to see that it has been made thoroughly clean and aseptic. The bladder may then be washed out with a warm solution of borax and boric acid—weak solutions of chloral and of carbolic acid have also been used. For dissolving phosphatic deposits in the bladder a very dilute nitric acid injection may be employed—1 dram

of dilute nitric acid in 10 ounces of warm water. (2) To prevent the further decomposition of the secretion, anti-fermentative drugs must be given. Sodium salicylate or sodium benzoate, in 10- to 15-grain doses three times a day, answers well. Whitla says he has found 8- to 10-grain doses of boric acid by the mouth of "surprising" efficacy. We have ourselves found salol very useful in these cases. It has been stated that *benzoic acid* has the property of indefinitely postponing the occurrence of alkaline fermentation of the urine, and consequent cystitis, by its distinct bactericidal power; *urotropin* also appears to have a powerful influence of the same kind. Sir William Roberts has advocated drinking large quantities of fluid at regular intervals and encouraging regular micturition so as to keep the bladder washed out with the renal secretion. Buchu, santal, juniper, turpentine, resórcin, and many other drugs of this class, have been used by different physicians with more or less success.

HÆMATURIA.

Blood may appear in the urine under a variety of circumstances.

A frequent cause is the presence of a calculus in the kidney or urinary passages, producing laceration of the blood-vessels; when there is a small calculus in the kidney any jolting movements of the body, as in riding or driving, or any sudden jar, may determine the occurrence of hæmaturia. Blood may also be poured into the urinary passages from laceration of the kidney or rupture of blood-vessels in the urinary tract from external mechanical injury, as in falls on the back, railway accidents, etc. Hæmaturia from undue sexual excitement may be classed under this heading.

Congestive or inflammatory states of the kidney, bladder, or urethra may also lead to the presence of blood in the urine, as in acute Bright's disease, cystitis, and gonorrhœa ; embolic infarcts from ulcerative endocarditis, when lodged in the kidneys, also usually lead to the escape of blood with the urine.

New growths, such as cancer, and tubercle in the kidneys or bladder, and villous growths in the bladder, cause hæmaturia.

The so-called " endemic " hæmaturia which occurs in Egypt and elsewhere is *parasitic* in its nature, and attributable to infection by the *Bilharzia hæmatobia.*

Hæmaturia may also depend on some general morbid blood state, as in purpura, scurvy, malarial fever, small-pox, etc. There are also the toxic forms, dependent on the introduction into the blood of matters peculiarly irritating to the kidneys, as cantharides, turpentine, and, in some rare instances, quinine.

Finally, in some cases it may occur without the existence of any discoverable cause.

Certain cases of this kind have been termed "*renal hæmophilia*" and "*vaso-motor hæmaturia,*" and referred to an *angio-neurosis* of the kidney. Several such cases have been recorded where no cause could be ascertained even after nephrotomy and nephrectomy, but a large proportion of these cases were cured by operation !*

There can rarely be any difficulty in the detection of the presence of blood in the urine—in moderate or large hæmorrhages the colour is sufficiently characteristic ; indeed, the urine often looks like pure blood ; —in cases where there is but a scanty outpour the microscope or the guaiacum test may be applied.

It is often important to determine the **seat** of the hæmorrhage. It is as well to bear in mind that in women the blood may come from the uterus. If during micturition it can be observed that the flow of blood comes first and is followed by a clear stream of urine, then it is pretty clear the blood must come from the urethra. The presence of flat blood clots in the urine points to their formation in the floor of the bladder, while cylindrical casts of the ureters indicate a higher origin, and blood casts of the uriniferous tubules point to their formation in the renal cortex and to the probable existence of acute nephritis. If the blood is only passed at the end of micturition its source is commonly the bladder. When the blood comes from the pelvis of the kidney it is always intimately mixed with the urine.

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* *Clinical Journal*, February 22nd, 1899 ; and *Medical Annual* for 1901. "Surgical Diseases of Kidney," by Mr. Hurry Fenwick, p. 339.

A dark brownish colour of the urine has also been regarded as affording presumptive evidence of a renal origin of the blood, the blood corpuscles having been acted on by acid and their hæmoglobin converted into acid hæmatin. But in *profuse* hæmorrhage the acid is insufficient to produce this change. When the urine is pink or bright red this is due to alkaline reaction, and the bladder is probably the seat of the bleeding.

Profuse hæmorrhage from the bladder, unaccompanied by other symptoms, is usually dependent on villous tumour or malignant growths.

Besides the presence of blood in the urine, we may have symptoms of renal colic from blood clot arrested in the ureters, or dysuria, from the presence of a large coagulum in the bladder.

After these preliminary etiological and other considerations, we may now pass on to consider the **treatment** of hæmaturia.

The indications are, first, to arrest the hæmorrhage, which may be in itself dangerous, although very rarely fatal; and secondly, to remove the cause, which, however, may not be possible.

It should be remembered that drugs have been found to have less effect in this than in most other forms of visceral hæmorrhage.

When the bleeding is clearly due to the presence of renal calculus, absolute rest in the recumbent position, bland, cold, acidulous drinks, such as raspberry vinegar in iced water, or barley water with sliced lemon in it, or lemon whey, will usually suffice to arrest the milder forms. If, however, these measures are not adequate, we may give gallic acid in 5- to 10-grain doses, with 3 or 4 minims of dilute sulphuric acid in an ounce of cinnamon water every two or three hours. If there should also be pain and restlessness, we should add ⅛ or ¼ grain of acetate of morphine to each dose.

Hypodermic injection of ergotin or of ergotinine is often an effectual remedy. Oil of santal and oil of turpentine, in capsules, are useful in certain cases when the bleeding is from the pelvis of the kidney, but they are contra-indicated in hæmorrhage from the cortex, as in acute nephritis. Hamamelis and hydrastis canadensis are commended by some. Acetate of lead and opium is an old and favourite remedy. In certain cases the tincture of perchloride of iron is one of our best resources. External applications may be occasionally of use, and ice-bags to the loins, when the hæmorrhage is from the kidneys, and to the hypogastric region when from the bladder, have been found useful. Dry-cupping to the loins in congestive or inflammatory cases is a good expedient, and if the bleeding should be traceable to a toxic irritant, like cantharides, warm fomentations may also be applied, together with the internal exhibition of aperients and *diaphoretics*. In this latter connection it may be mentioned that Whitla has found tincture of jaborandi, in half-dram doses, of great value "in most forms of renal hæmorrhage."

When the hæmorrhage is from the bladder, the injection of astringent solutions into this organ is indicated after as complete removal as possible of its contents. One of the best is a solution of alum, 2 grains to the ounce; or one of nitrate of silver, 10 grains to the pint; or of hazeline diluted with twice as much water; or of perchloride of iron, a dram to a pint. Another expedient is the injection of iced water into the rectum.

Hæmaturia occurring in the early stage of acute nephritis, or from acute congestive conditions, rarely needs any active interference for its arrest, beyond hot applications to the loins as already mentioned.

Solutions of gelatine have been employed in this as well as in other forms of hæmorrhage. Schwabe* has reported its successful use in a case of recurrent nephritis when other remedies had failed. He injected into each infra-clavicular region 7 drams of physiological salt solution containing 2 per cent. of pure gelatine, followed, for a week, by the daily consumption of a pint of a 10 per cent. gelatine solution. It is still a matter of some uncertainty whether the subcutaneous injection of solutions of gelatine is free from risk. We think it is not. Its administration by the stomach is of course perfectly safe ; indeed it is abundantly present in many common articles of diet, such as soups, jellies, etc. ! We therefore greatly doubt its therapeutic significance administered in this way.

Supra-renal extract and *adrenalin chloride* (a crystallin body professing to represent its active principle) have been recommended as very efficacious in some forms of hæmaturia, but more experience is needed in order to determine the class of cases most suited to this treatment. It must be remembered that these bodies raise arterial tension, and must therefore be avoided in cases where vascular pressure is already increased.

The causal indications would lead us into the consideration of the treatment of the several different diseases of which hæmaturia may be a symptom, for which there may be occasion hereafter. Some of these, as cancer and tubercle, are obviously incurable.

HÆMOGLOBINURIA.

In this case the urine has the same aspect as in hæmaturia, but on microscopical examination no red blood corpuscles can be found in it, and the urine is reddened by the colouring matter, the hæmoglobin of the blood. The urine is usually of a dark red or chocolate brown colour, although it may sometimes be merely pinkish. It commonly throws down a sediment of dark-brown lithates, and oxalate of lime crystals are also often deposited. It is believed that the hæmoglobin is set free in the blood before its excretion in the urine.

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* The *Practitioner*, December, 1900, p. 718.

Three forms of hæmoglobinuria have been described: (1) *paroxysmal;* (2) *toxic;* and (3) an epidemic *infantile* hæmoglobinuria.

It is the first or *paroxysmal* form that chiefly concerns us now. This is a rare and remarkable malady. The *causation* of this disease is often obscure, but in most cases the *exciting* cause, at any rate, appears to be exposure to *cold.* The attacks will often cease during the warm season and return in the cold season. A cold foot-bath has brought on an attack in a patient subject to them. Bodily or mental fatigue, especially when combined with cold, is provocative of attacks. It has been thought to be closely related to malaria, but this is doubted by Osler and others. It has been observed in association with syphilis, and in cases resembling Reynaud's disease. It is more common in men than women.

The attacks are often preceded by chilliness and languor, and coldness and blueness of the hands and feet. Sometimes there is pyrexia, but more frequently the temperature and the pulse are sub-normal. Jaundice is sometimes present. Pain across the loins is sometimes complained of. The hæmoglobinuria rarely lasts more than a day or two, and cases have been seen in which there were two or three attacks in a day, the urine becoming clear in the intervals.

It has been suggested that the disease originates in "an undue sensitiveness to cold on the part of certain of the red blood-discs" (*Fagge*), which then allow their hæmoglobin to escape into the blood serum.

The **treatment** of the paroxysmal affection mainly consists in protecting those who are subject to it from cold and fatigue, and especially from exposure to cold *when* fatigued. Residence in a warm climate in the winter is most desirable when practicable. During an attack, the patient should be put into a warm bed and given some hot soup. Pain in the back may be relieved by mustard poultices over the lumbar region and by extract of henbane, as recommended by Druitt, who suffered himself from this malady. The daily routine of life should be so arranged that the subject of these attacks should always be well nourished by suitable food and at suitably-arranged meal-times. He should never be exposed to any exhausting efforts, physical or mental. He should be very warmly clothed, and the hands and feet should be especially cared for in this respect.

Alcoholic drinks appear to be injurious; but a cup of hot beef-tea on waking in the morning has been said to prove an effectual preventive. Quinine in full doses has been found by some physicians to be capable of warding off the attacks; but in some cases it seems to be useless, even when taken in very large doses. Ammonium chloride, salicin, iron, and arsenic have each had their advocates. It is said that amyl nitrite will sometimes cut short and prevent attacks. In syphilitic cases, potassium iodide and mercuric chloride have sometimes produced a cure.

The **toxic** form is caused by such poisons as produce rapid dissolution of the blood corpuscles, and it is only of interest to us now in order to set us on our guard as to the detection and removal of such causes. Large doses of potassium chlorate, carbolic acid, pyrogallic acid, arseniuretted hydrogen, carbon dioxide, naphthol, muscarin, and also the poisons of malaria, yellow fever, scarlet fever, typhoid fever, and syphilis, have all been found, at times, capable of producing hæmoglobinuria. Transfusion of blood from one mammal into another will sometimes be attended with this symptom.

CHYLURIA.

This term is applied to the presence in the urine of fat in a state of minute subdivision, giving it the appearance of milk.

The presence of chyle in the urine no doubt arises, in most cases, from a communication becoming established between distended lymph vessels, connected with the lacteals of the small intestine, and some part of the urinary tract. It is usually regarded as dependent upon blocking of some of the lymphatics by the immature ova of the *filaria sanguinis hominis*, though Osler and others maintain that there is also a non-parasitic form the pathological nature of which is unknown.

The prophylactic measures against the introduction of this parasite into the body, when living in countries where it is known to exist, consist in the adoption of the precaution, so commonly advocated, of not drinking water that has not been previously boiled, unless we are absolutely sure of its purity, and in thoroughly washing all raw vegetables before consumption with water that has been boiled. Whether the parasite can be destroyed in the blood-vessels seems doubtful. The inhalation of ether or some other volatile anæsthetic has been suggested, but to be successful it would probably have to be repeated frequently for a long period. Astringents have been given internally, and injected into the bladder, with the idea of closing the communication between the lymph-channels and the urinary passages, and some success is said to have attended their use. Bence Jones and Waters found gallic acid cause the disappearance of the chylous aspect of the urine; it has been given in doses varying from 30 to 130 grains daily. Nitrate of silver, acetate of lead, and mineral acids have also been used. *Thymol* has been given, in doses of 1 increased to 2 grains, it has been said with the disappearance of *filaria* in a few weeks; but Manson discredits this statement entirely.* Should the urine coagulate in the bladder, as it has been known to do occasionally, and so cause retention, as large a catheter should be passed as possible, fitted with an aspirating syringe, and the coagulum should be broken down by the alternate injection and withdrawal of a warm solution of sodium bicarbonate.

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* "Tropical Diseases."

ALBUMINURIA.

The occurrence of albumen in the urine, as a symptom of Bright's disease, will concern us when we are dealing with the treatment of that affection; at present we propose to limit our observations to the occurrence of albumen in the urine independently of the existence of any serious organic change in the kidneys. Nor are we now concerned with the albuminuria which occurs in the course of most acute infectious diseases, as in diphtheria and typhus, or in that which depends on passive engorgement of the kidneys from respiratory, circulatory, or mechanical obstruction, as in advanced pulmonary emphysema, cardiac disease, or abdominal tumours; nor in that which may be caused by overdoses of certain drugs. Albumen in the urine may occur in these and other morbid conditions without presenting any therapeutic indications; it is simply a symptom or accident of the disease with which it is associated, and it is only in this association that it can be profitably considered.

But albumen is occasionally found in the urine of persons **apparently healthy.** To this condition the terms "physiological," "functional," and "cyclic" albuminuria have been applied. All these terms are faulty; the term "physiological" rests on an assumption for which there is certainly no solid foundation; the term "functional" is an unsafe one, because it conveys an *opinion* instead of merely stating a fact; and the term "cyclic" implies a limitation of the circumstances in which it occurs inconsistent with recorded observations. After twenty years of daily examination of candidates for life assurance, chiefly amongst the middle classes, of all ages from 17 to 70, we have exceedingly rarely, if ever, encountered albuminuria in a person who was in every respect in sound and vigorous health. It occasionally occurs in weedy young men who are indulging in habits inconsistent with their physique—either in athletic exercises beyond their natural capabilities, or in what is, for them, sexual excess (although it might not be for their more robust companions); or they are consuming too much tobacco and lowering the cardiac tone. In schoolboys, and in other youths also, its occurrence may constantly be traced either to masturbation, to exposure to cold, or to excessive physical exertion. When it depends on diminished circulatory tone ("vascular asthenia" Sir William Gull used to term it) from physical exertion, it is remarkable how small an amount of exercise in some persons will determine it. We made some observations in the case of a gentleman who was accidentally discovered to have albuminuria on being examined for admission to a yeomanry regiment. In this case we demonstrated that it was not "cyclic," although it might be said to be "intermittent"; but it was always most manifest after his morning walk when he returned home to lunch; it was much less manifest on rising in the morning, *and after dinner*, at which he drank a pint of claret, it would entirely disappear. When the circulatory tone was raised by rest and food and wine the albuminuria disappeared.

In other cases in which intermittent albuminuria has been observed, it appears to have been traceable to chill, to taking a cold bath or remaining too long in it, or exposing the surface of the body to cold air.

Whether over-feeding and dyspeptic conditions can of themselves produce albuminuria is a matter of doubt; that the occurrence of albumen in the urine, in the class of cases we are considering, is limited to the period of digestive activity is, we think, an erroneous conclusion.*

It is, of course, important, in connection with this matter, to remember that the urine may frequently be found to contain a trace of albumen from the presence of mucus or blood from other sources than the kidneys; the admixture of a little prostatic fluid or urethral mucus in men, or vaginal discharges in women, will often cause urine to give this reaction. It is rare to obtain a specimen of urine from the female in which this is not the case. Of so-called "emotional" albuminuria we have no knowledge. Playing on wind instruments is said to have led to albuminuria in boys.

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* The relation of albuminuria to food is discussed in the author's work on "Food in Health and Disease," p. 432.

The successful **treatment** of these conditions depends on seeking out the cause and adopting measures to remove it. When it is due merely to anæmia or loss of tone, to "vascular asthenia," and occurs chiefly after exercise or exertion, it should be treated by general tonic measures.

Physical exercise should be limited to such only as is necessary to health; gentle walking or riding exercise may be permitted, always stopping short of any fatigue. It is, therefore, better to recommend that the daily exercise should be taken in repeated short walks or rides rather than in one or two long ones, and that the exercise should be taken, not in the early or late hours of the day, but chiefly in the afternoon, an hour or so after the mid-day meal. The food should be light but nutritious, and contain a due amount of digestible animal food. There is no need, nor is it desirable, to exclude animal albuminates from the dietary. Some sound Burgundy or other suitable wine may be taken at meals, diluted with a little water.

As a tonic, a combination of iron, quinine, and strychnine is most useful; we are in the habit of prescribing 10 to 20 minims of the tincture of the perchloride of iron, 1 to 3 grains of sulphate of quinine, and 3 to 5 minims of the solution of strychnine in an ounce of chloroform water thrice daily, about two hours after a meal.

In cases in which there is reason to believe that the albumen is dependent upon a dyspeptic state, with a tendency to hepatic congestion from overfeeding or too great a consumption of animal food, then we should counsel a more liberal use of vegetable food, together with milk, and we should forbid eggs, and limit the nitrogenous food taken to a little fish or white meat. At the same time the bowels should be kept freely open by some saline aperient, such as 3 or 4 ounces of Apenta water or Carlsbad salts, 2 or 3 teaspoonfuls in a tumblerful of warm water, taken in the morning fasting. The action of the skin should be promoted by hot or Turkish baths, with free friction of the surface. A certain amount of regular, moderate exercise should also be enjoined.

If the albuminuria should appear to be due, as has been suggested it may be in dyspeptic persons, to the irritation of the urinary mucous membrane by crystals of oxalate of lime or uric acid, the free ingestion of hot water, containing some alkaline salt in solution, should be ordered. A claret-glass of warm Vichy water may be taken half an hour before each meal and at bed-time; or, what answers as well, a glass of warm water, containing 10 or 15 grains of potassium bicarbonate in solution, and made to effervesce with a teaspoonful of lemon-juice.

Co-existing dyspeptic symptoms must, of course, be treated in the ordinary way.

For the albuminuria observed in schoolboys and adolescents, we would counsel a careful inquiry into habits, with the view of correcting any vicious tendency that may possibly be found to exist; we should forbid all athletic exercises for a time, and restrict the diet chiefly to milk and vegetable food; we should inquire if any digestive troubles exist, and especially if there has been any inattention to the action of the bowels. School tasks should be light, and mental and physical rest insisted upon.

The cases that are traceable to exposure to cold suggest the insistence on warm clothing, and the avoidance of cold baths, cold bed-rooms, and standing about during out-door games, or other out-door pursuits, in cold weather.

Albuminuria in a child having an elongated prepuce has been relieved by circumcision. Whatever other measures may be desirable in the treatment of albuminuria will be considered in connection with the treatment of the several forms of Bright's disease.

ADDITIONAL FORMULÆ.

For lithiasis.

℞ Lithii citratis, gr. x.
Acidi citrici, gr. xx.
Syrupi aurantii, ʒss.
Aquæ ad ℥ij.

M. To be taken in effervescence with 14 grains of sodium bicarbonate dissolved in 2 oz. of water. (*Guy.*)

Pills for lithiasis.

℞ Sodii carbonatis exsiccatæ, gr. xlv.
Extracti gentianæ, gr. xlv.
Saponis, gr. xlv.
Pulveris zingiberis, gr. xlv.

M. et divide in pil. centum. Five to ten daily. (*Ewald.*)

Mixture for the same.

℞ Liquoris potassæ, ʒij.
Tincturæ serpentariæ, ℥j.
Syrupi zingiberis, ℥ss.
Infusi serpentariæ ad ℥xij.

M. f. mist. Three tablespoonfuls twice a day. (*Paris.*)

Another.

℞ Sodii bicarbonatis, ʒjss.
Acidi benzoici, gr. xl.
Sodii phosphatis, ʒiij.
Tincturæ hyoscyami, ℥ss.
Aquæ cinnamomi, ℥viij.
Aquæ ad ℥xij.

M. f. mist. Two tablespoonfuls three times a day (*G. Bird.*)

In oxaluria with debility.

℞ Acidi nitrici diluti, ♏v.
Acidi hydrochlorici diluti, ♏v.
Infusi serpentariæ, ℥j.

M. f. haust. To be taken three times a day. (*G. Bird.*)

Mixture and pills for oxaluria.

℞ Acidi nitrici, ʒj.
Acidi hydrochlorici, ʒiij.
Aquæ camphoræ ad ℥iv.

M. f. mist. A teaspoonful in a wineglassful of infusion of camomile three times a day.

℞ Pilulæ hydrargyri subchloridi compositæ, gr. v.

F. pil. To be taken every night. (*G. Bird.*)

For lithiasis.

℞ Potassii bicarbonatis, ℥jss.
Acidi citrici, ℥j.
Aquæ, ℥xij.

M. f. mist. Two tablespoonfuls with twice as much water for a dose. (*Picard.*)

For hæmaturia.

℞ Acidi gallici, gr. x.
Acidi sulphurici diluti, ♏xiij.
Aquæ, ℥j.

M f. haust. For one dose. (*Brinton.*)

For hæmaturia.

℞ Olei terebinthinæ, ʒj.
Acidi sulphurici diluti, ♏lxxx.
Acidi gallici, ʒss.
Mucilaginis acaciæ, ℥ss.
Aquæ, ℥j.

M. f. mist. A dessertspoonful every three hours.

(*S. D. Gross.*)

For hæmaturia.

℞ Ergotini, gr. xv.
Pulveris acaciæ, gr. xxx.

M. et divide in pulv. vj. A powder every three hours.

(*Ultzmann.*)

Or,

℞ Extracti ergotæ fluidi, ♏xiv.
Acidi gallici, gr. x.
Aquæ cassiæ ad ℥j.

M. f. haust. For one dose.

(*Fenwick.*)

For hypodermic injection in hæmaturia.

℞ Ergotini, gr. xlv.
Glycerini, ʒij.
Aquæ ad ℥ss.

M. Twenty minims to be injected thrice a day.

(*Ultzmann.*)

CHAPTER II.

THE TREATMENT OF RENAL CALCULI AND THEIR CONSEQUENCES—HYDRONEPHROSIS—PYURIA—PYELITIS—CYSTITIS.

The occurrence of *Renal Sand* or *Gravel*—Composition of Rena Calculi—Causation of Calculi—Symptoms of Renal Calculus.

RENAL COLIC. *Indications for Treatment*—In the *Paroxysms*—Morphine Hypodermically—Chloroform Inhalations—Hot Drinks—Hot Baths—Enemata of Chloral, or of Opium and Belladonna—In the *Intervals*—Courses of Mineral Waters—Solvent Treatment—Surgical Treatment.

HYDRONEPHROSIS. Causes—*Treatment*.

PYURIA AND PYELITIS. Causes—Symptoms—"Pyonephrosis"—Perinephritic Abscess—*Treatment*—Cases of *Cystitis*. Additional Formulæ: Glycerine in Uric Acid Calculi.

As the most common cause of pyelitis, and of the presence of *pus* in the urine, is the existence of **renal calculus,** it will be convenient to consider, in the first place, the treatment of renal calculi and their consequences, so far as they, directly or indirectly, concern the physician.

We have already seen, in considering the subject of the occurrence of certain crystalline deposits in the urine, that the chief danger in the tendency to these depositions is, lest they should occur in the urinary passages and form calculi. It is to the deposition of certain of the solid constituents of the urine, as concretions within the pelvis and calyces of the kidneys, and the symptoms and conditions arising therefrom, and the best methods of treating such states, that our attention must now be directed.

Such concretions occur in various forms; they may simply appear as small, gritty particles, as mere grains of *uric acid*, or they may be of the size of coarse sand, and such collections of *renal sand* or gravel may be passed with the urine, again and again, without giving rise to any serious symptoms, as the individual particles are not large enough to be arrested in their passage along the urinary tracts.

But larger concretions also form, varying greatly in size, and the largest are apt to remain in the pelvis of the kidney, and give rise to serious symptoms from their presence there, and others may (and this is especially the case with the smaller concretions) pass into the ureters, and, during their passage along those ducts, give rise to agonising attacks of **renal colic.** Such small concretions may be numerous, and then they are often rounded and smooth, and patients will be found to pass considerable numbers of such small rounded calculi again and again. Single calculi are, perhaps, more apt to be angular and irregular, having the aspect of an agglomeration of crystals, and these, doubtless, give rise to the severest attacks of pain in their passage. In some rare cases calculi of large size form in the pelvis of the kidney, and become moulded, as it were, to its cavity, and project also into the ureter and block it.

Renal calculi are most commonly composed of *uric acid* mixed with urates; these are of a light reddish or fawn colour, and have usually a smooth surface; others are composed of *oxalate of lime* and uric acid; they are of very dark colour and rough surface (hence termed "*mulberry* calculi"). Phosphatic calculi are rare in the kidney; they are usually formed in the bladder, the phosphates being deposited around a nucleus of uric acid or oxalate of lime. We have already considered the conditions which lead to the precipitation of these deposits in the urine.

It is important to remember that in patients who pass *acid* urine, the only concretions likely to be met with are those which depend for their formation on the deposition of uric acid or oxalate of lime, and that phosphatic calculi are usually associated with the occurrence of alkaline urine, and occur as a deposition upon a pre-existing nucleus of uric acid or oxalate of lime.

It is, therefore, against the precipitation of these substances that protection is needed.

It is difficult in many cases to offer a satisfactory account of the origin of calculi. It has been suggested that drinking "hard" water—water saturated with lime salts—favours their occurrence, and no doubt such water cannot so well perform its solvent functions within the body as water which is quite pure.

For further considerations on the etiology of such deposits, we must refer to what we have already said under lithiasis and oxaluria.

The symptoms and common consequences of renal calculus are the following: (1) pain in the loins especially excited by jolting or shaking of the body; (2) local tenderness on pressure over the affected kidney in the loin or on its anterior aspect; (3) hæmaturia, rarely profuse or constant, and subsiding on complete rest in bed; (4) renal colic; (5) anuria or hydronephrosis from obstruction of ureter; (6) pyelitis. Hæmaturia and its treatment we have already considered. *Pain in the back,* when not associated with other symptoms of renal colic, and when not attended with hæmaturia, is sometimes, perhaps rather vaguely, referred to renal irritation from highly acid urine, or from some crystalline deposit in the pelvis of the kidneys, and if this "lumbago" is found to coincide with the passage of highly acid urine freely depositing lithates, and if it is found to be relieved by the administration of alkalies, this view of its causation may be correct. At any rate no harm can arise from treating this symptom, when accompanied by such urine as we have described, by the free exhibition of dilute alkaline drinks. It should be borne in mind that the pain of renal calculus is especially prone to extensive transference to distant regions along the course of the branches of the lumbar plexus—the testicle, the upper part of the thigh, the leg, and inside of the foot, and sometimes it is felt severely in the course of the sciatic nerve.

One of the most serious and painful consequences attending the existence of renal calculi are paroxysmal attacks of *renal colic.*

RENAL COLIC.

An attack of renal colic is produced by the entrance of a urinary concretion into the ureter. Its onset is frequently sudden and violent, and the pain is often most agonising. It may occur when the patient is at rest, or it may be induced by some jarring movement or muscular effort. The pain usually starts from one loin, and extends downwards along the course of the ureter; it may radiate more widely over the abdomen, and is sometimes felt chiefly in the iliac region; it commonly shoots into the corresponding testicle, which is often retracted and tender, and the pain may be felt along the inner side of the thigh. The intensity of the suffering causes the patient to turn deadly pale, and drops of perspiration break out on his forehead. There is also often a feeling of chilliness, almost amounting to a rigor, the pulse is small and feeble, the breathing hurried, and the temperature sometimes rises; nausea and vomiting frequently, but not always, accompany the attack. The patient often adopts strange positions to relieve his sufferings. Some cessation of pain may occur from time to time throughout the paroxysm, but it returns again and again, until after a variable duration the paroxysm may suddenly cease with the escape of the stone into the bladder. The amount of suffering probably depends greatly on the form of the calculus and the character of its surface rather than on its size; a smooth, round, uric-acid calculus may give far less pain in passing along the ureter, although twice or three times the size, than one of oxalate of lime with a rough, uneven surface. The urine, which is usually passed frequently and with pain, often contains blood.

Recurrent attacks of this kind are sometimes encountered, without any evidence that a calculus has passed from the kidneys into the bladder; in such cases it is probable there is a stone in the pelvis of the kidney, which from time to time passes into the upper part of the ureter, but being of too large a size to pass through that conduit, falls back again into the pelvis of the kidney. The passage of a clot of blood along the ureter may also give rise to an attack of renal colic. If the calculus remains in the kidney it usually gives rise to characteristic symptoms, of which *pain* in the back of a dull, wearing nature is the most constant; it is commonly referred to the affected side, and pus, mucus, or albumen is found daily in the urine in varying quantity.

The indications for **treatment** in cases of renal colic *during the paroxysm* are: (1) to allay pain and spasm; and (2) to further the passage of the calculus along the ureter, by flushing the kidneys with bland, diluent, mildly alkaline drinks; (3) and *in the intervals* to prevent the formation of fresh concretions and to promote the solution or painless discharge of those that remain.

The hypodermic injection of morphine ($\frac{1}{4}$ of a grain) with atropine ($\frac{1}{100}$th of a grain), every hour or two for three or four doses until relieved, is the best means at our disposal for the relief of violent pain and spasm. In slight cases, if seen at the onset, one injection will often be sufficient to induce sleep, and the patient will not unfrequently wake up free from pain; but in recurrent or severe cases repeated doses will sometimes be necessary. Some alcoholic stimulant should, at the same time, be administered when these repeated doses of morphine are used, as they are apt to cause some cardiac depression. Before administering the injection, let the patient drink 8 to 16 ounces of hot water, or hot water with a little milk added, and 20 grains of sodium or potassium bicarbonate dissolved in it, and give him a like draught on waking from the morphine sleep.

In cases where full doses of morphine or opium are counter-indicated, as in most cases complicated with Bright's disease, we must have recourse to inhalations of chloroform or ether, and in slighter cases of renal gravel opium may be replaced by henbane, 20 to 30 minims of the tincture in an ounce of chloroform water. The hot bath, which is so highly extolled by some physicians for the relief of the spasm, should be employed as an auxiliary in protracted attacks, but it cannot take the place of morphine or chloroform. The same may be said of hot poultices and fomentations. If for any reason it should seem more desirable to administer remedies by the rectum, solution of chloral, or of opium or belladonna, may be administered in the form of small enemata, or large enemata of warm water have been found soothing.

For the purpose of flushing the urinary passages and diluting the urine, the patient should drink freely of warm barley water, or of hot milk and Vichy water, in the proportion of 1 part of the former to 4 of the latter, or of a mixture of equal parts of warm lemonade and potash water, at choice.

Inversion of the patient and shaking are said to have been occasionally attended by immediate cessation of pain.

Highly important also is the **treatment in the intervals** with the view of preventing the formation of fresh concretions, and of dissolving or promoting the painless discharge of such as may remain in the kidneys.

It is for this purpose that patients who suffer from renal colic are sent to drink mineral waters at Vichy or Ems, or at Contrexéville, Vittel, or Evian. The former are alkaline waters, the latter are waters which, we believe, act chiefly mechanically and by their diluent quality. The latter are usually administered in very large quantities when it is desired to procure the expulsion of calculi from the pelvis of the kidney.

Patients at either of these spas will often be found to pass numerous small uric-acid concretions, in some cases year after year, and not unfrequently concretions also of considerable size are got rid of; this is especially the case at Contrexéville.

There is some difference of opinion as to the possibility of exerting any solvent action on urinary concretions within the body. Sir William Roberts believed that this was possible in the case of uric-acid concretions (as uric acid is soluble in alkaline solutions), if we give alkaline drinks in sufficient quantity and for a sufficient length of time. The urine must be kept continuously alkaline for long periods. In order to effect this, the following mixture should be prescribed :—

℞ Potassii bicarb....	... ...	10 drams.
Acidi citrici	... ...	7 „
Aquæ destill.	... ... ad	10 oz.

M. f. mist.

From half an ounce to an ounce of this mixture (equal to 60 grains of potassium citrate) should be given in a claret-glass of water every three hours for several months. Potassium acetate seems to agree better with some patients. The reaction and density of the urine should be frequently tested, especially the morning urine, which is most prone to become acid. The density should be kept low by increasing, when needful, the intake of water.

With regard to the value of the recently-introduced "solvents" of uric acid, such as *Piperazin*, much difference of opinion exists. Professor N. S. Davis, jun.,* thinks it "certainly efficacious." He thinks "it increases the oxidation of excrementitious matter and makes uric acid soluble," that it "lessens its formation and aids its elimination," that it dissolves "uric acid sand, and sharp corners of even larger stones can be smoothed." One of his patients, who suffered from uric acid gravel, "passed smooth stones whenever piperazin was used for some time (45 grains daily), and angular, acicular stones when it was not employed." In our own practice we rarely use it on account of its occasional depressing effects, and because we find we get quite as good results with the alkaline salts of the organic acids.

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* Hare's "System of Practical Therapeutics" (new edition), vol. ii., p. 501.

The diet should be carefully regulated on the lines already laid down in treating of lithiasis.

When there is clear evidence of the presence of a stone impacted in the kidney, and giving rise to painful and exhausting symptoms which are otherwise irremediable, surgical measures must be resorted to for its removal.

According to Henoch, *children* suffer frequently from renal calculi, but suffer much less pain in their passage down the ureter than adults. They are usually males, of gouty parentage, and the calculi are composed of uric acid. He treats their attacks with hot baths, fomentation to the affected side, and a mixture composed of ammonium bromide, sal volatile, and compound tincture of camphor.

HYDRONEPHROSIS.

This term is applied to an accumulation of fluid in the ureter and pelvis of the kidney, due to obstruction in the former, and it may, therefore, be caused by the impaction of a renal calculus in the ureter. Obviously other pathological conditions may lead to obstruction of the ureter, such as stricture from cicatrisation of an ulcer of its mucous lining, or external compression, from whatever cause. Moreover, bilateral hydronephrosis may arise from compression or obstruction of both ureters, or from obstruction lower down and dependent on urethral stricture, prostatic enlargement, or disease of the bladder itself.

But the most common cause of unilateral hydronephrosis is impacted renal calculus; and in such cases, if the obstruction is complete, the distension of the kidney and atrophy of its substance may reach an extreme degree, so that it is finally converted into an enormous cyst, which is apparent as a large tumour in the region of the kidney. Such a tumour may occasion some difficulty in diagnosis, and in the female especially may be mistaken for an ovarian cyst. Aspiration of a portion of the fluid may remove the difficulty, as the fluid from a hydronephrotic cyst contains some of the constituents of urine, such as urea and uric acid.

There are rare instances of *intermittent* hydronephrosis, in which, after the discharge by the urethra of a large quantity of clear fluid, the tumour suddenly disappears. After a time the sac refills, and the tumour reappears. These are the most hopeful cases, since it is clear that, whatever the nature of the obstruction, it is not insurmountable. It may be also as well to remember that the sac will sometimes discharge itself spontaneously through the ureter, and the fluid never re-accumulate.

In bilateral cases, or in the event of the ureter on the sound side becoming blocked by a calculus, uræmia may supervene.

Many other points of pathological interest, associated with the development and history of these hydronephrotic cysts, do not concern us here, and we must now limit ourselves to a consideration of such **therapeutic** measures as they call for.

Unilateral hydronephrosis is rarely of itself fatal, and spontaneous cure is not unknown, and we should, therefore, not advise active interference until the patient is able to bear the pain and inconvenience it causes. The intermittent cases should certainly be left alone.

Manipulation and compression of the tumour through the abdominal wall have occasionally led to its dispersion. Such manipulations should, however, be practised with very great care, lest rupture of the sac should be produced.

But when the sac is tense and painful it is best to puncture with a fine trocar, and aspirate, and withdraw the whole of the fluid. The best place for puncture on the *left* side is just in front of the last intercostal space. But on the *right* side it is advisable, in order to avoid the risk of wounding the liver, to puncture lower down—a spot midway between the last rib and the iliac spine, and about two inches behind the latter, may be selected. The sac is prone to refill and repeated puncture may be needful; cases are on record of permanent shrinking after several tappings.

It is supposed either that the fluid does not re-accumulate, because of the destruction of the whole of the secreting structure of the kidney, or that the tapping removes pressure and irritation, and, as a consequence, the impacted calculus is set free and the obstruction is removed.

Nephrotomy with drainage and antiseptic irrigation, according to Henry Morris, is the proper operation, to be preferred to aspiration; lumbar nephrectomy is needful in some cases.*

PYURIA (*pus in the urine*) AND PYELITIS.

The occurrence of *pus* in the urine is often the consequence of suppurative pyelitis, set up by irritation of the mucous membrane of the pelvis of the kidney by the presence there of a renal calculus. This suppurative inflammation may pass downwards along the ureter and reach the bladder. Or the order may be inverted, and suppurative pyelitis may be, and often is, the result of an ascending infection (the introduction of septic organisms) from the bladder (cystitis), or the prostate (prostatitis), or the urethra (gonorrhœa).

Tuberculous disease of the kidney usually gives rise to pus in the urine; and pus in the urine may occasionally depend on the rupture of an abscess of adjacent parts into the urinary *passages.*

The following are the common *symptoms* of calculous pyelitis: pain in the region of the kidney, especially on the diseased side; pus, and sometimes blood, in the urine; fever of a hectic or remittent or intermittent type, often accompanied by periodical rigors; diarrhœa or constipation may prevail. Should any obstruction arise to the free discharge of the pus, it may, as in hydronephrosis, accumulate in the pelvis of the kidney, and cause great distension of this organ and the appearance of an abdominal tumour, "*pyonephrosis.*"

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* Allbutt's "System of Medicine," vol. iv., p. 433.

Such a condition may occasionally terminate favourably, after a certain period, by subsidence of the inflammation, and a shrinking and drying up of the kidney into a putty-like mass. But the prognosis is not usually favourable, and one of the most unfavourable results is the formation of a *perinephritic abscess*, dependent generally on ulceration and perforation of the mucous membrane and the escape of pus and urine into the adjacent connective tissue. The perinephritic abscess may point and burst and discharge in the loin, or it may burrow in various directions.

The **treatment** of pyuria must, of course, depend on its causes, and in most cases it must eventually be *surgical*. When pus in the urine is due to calculous pyelitis it can only be cured by the removal of the cause, viz. the calculus in the kidney, and the same methods already referred to for the promotion of the solution, or removal, of renal calculi may be applied. If the calculus is composed of uric acid, the alkaline treatment already described, together with an exclusively milk diet, or a diet almost exclusively confined to milk and the lightest of foods, or a course of mineral waters at Vichy or Contrexéville, may be attended by satisfactory results. If the calculus should be composed chiefly of oxalate of lime, solution cannot be looked for; but if it is not of large size, the discharge of such a stone during treatment at Contrexéville is by no means an uncommon event. If a tumour forms in the loins, or should the patient's sufferings be great and otherwise irremediable, surgical interference is called for.

In the slighter cases of catarrhal pyelitis, such as occur in gouty or rheumatic subjects, warm baths, confinement to bed for a few days, and warm bland alkaline drinks, the avoidance of all possible irritants in the food, of which milk and its preparations are the most suitable, and the administration of salines and alkalies, will usually remove the symptoms complained of.

If the symptoms do not immediately yield, and pus, in small amount, continues to appear in the urine, some benefit may usually be derived from the administration of uva ursi, buchu, or pareira brava. Should the case tend to become chronic, the use of balsamic stimulants is indicated, such as oil of santal wood, copaiba, juniper, turpentine, etc. This last drug, though irritant in large doses, is often very useful in small doses in cases of chronic suppuration of the urinary tract. Wood recommends that it should be given in emulsion, in doses of 10 to 15 minims, mixed with a dram of glycerine and 1 or 2 drops of oil of wintergreen to cover its taste.

When suppuration is profuse it has been found advantageous to administer astringents by the mouth. Ultzmann has recommended tannin, tannate of quinine and alum. The last is given in the form of *alum-whey,* of which a pint is taken daily—45 grains of alum being added to every pint of whey. Or 15 grains either of tannin or of tannate of quinine may be given, mixed with a few grains of sugar in a cachet, thrice daily. The bowels must be regulated by an aloetic pill at night or a dose of sodium sulphate in the morning.

Warm baths, hot fomentations, dry cupping to the lumbar regions are all comforting expedients; local congestions are relieved and a relaxing effect is believed to be produced on the muscular fibres of the ureters.

The symptoms attending pyelitis have been observed to be aggravated in women during the catamenial period. In such cases rest in bed should be enjoined, a combination of bromides and hyoscyamus administered, and frequent hot vaginal douches, for their revulsive effect, applied. When the presence of pus in the urine is dependent upon **cystitis,** or when pyelitis is complicated with cystitis, and the urine becomes alkaline or ammoniacal, then the administration of alkalies is unsuitable. It is by no means easy to render alkaline urine *acid*—the use of mineral acids by the mouth has no effect. Benzoic acid is very useful in the cystitis of gout and other catarrhal forms. Recent experiments have shown that it does not increase the normal acidity of the urine, but that it has a marked influence in postponing the occurrence of alkaline fermentation, and it imparts to the urine a distinct germicidal quality.

The dose is 10 to 15 grains thrice daily. **Urotropin** also appears to have the property of conferring a powerful bactericidal quality upon the urine. When given internally formaldehyde is found in the blood and is excreted in the urine. It is given in doses of 5 to 7½ grains three times a day. In these doses, when continued for two or three weeks, it has been found very valuable in checking the decomposition of the urine in cases of ammoniacal cystitis. Whitla commends very strongly the use of boric acid in these cases, in 5- to 15-grain doses three times a day. It is best given in a tumblerful of warm milk and water. We have also found salol very useful; one or two 5-grain tabloids may be taken every three or four hours.

Capsules of creasote or of eucalyptol (1 to 3 drops), taken with half a tumblerful of milk, or milk and water, four or five times a day, may also be found of value in preventing alkaline fermentation of the urine in the bladder. In some cases full doses of quinine and perchloride of iron are most useful.

The daily use of the catheter and washing out the bladder with boric acid solution is needful in most cases of chronic cystitis, but in some cases in which urotropin has been given the need for frequent irrigation of the bladder has been found much less urgent.

ADDITIONAL FORMULÆ.

For cystitis.

℞ Terebinthinæ puræ } āā
Extracti gentianæ } gr. xlv.

M. et. div. in. pil. xxx. A pill three times a day, followed by two tablespoonfuls of lime water in milk.

(*Prof. Neumann.*)

Also.

℞ Acidi benzoici, gr. lxxv.
Syrupi aurantii, ʒv.
Aquæ destillatæ ad ℥x.

M. f. mist. A tablespoonful every two hours. (*Neumann.*)

In chronic cystitis.

℞ Foliorum buchu, ʒij.
Foliorum uvæ ursi, ʒij.
Aquæ ferventis, ℥vj.
Macerate for two hours, strain, and add
Liquoris potassæ, ʒj.
Tincturæ cinnamomi, ʒiij.
Tincturæ hyoscyami, ʒiij.
M. f. mist. Two tablespoonfuls three times a day. (*Druitt.*)

For cystitis.

℞ Sodii bicarbonatis, gr. lxxv.
Decocti uvæ ursi, ℥vj.
M. f. mist. A tablespoonful every two hours.
(*Prof. Albert, Vienna.*)

For washing out the bladder.

℞ Aluminis
Zinci sulphatis
Acidi carbolici } āā ℥ss.
Aquæ destillatæ, ad ℥x.
M. f. lotio. To be mixed with ten times as much water, and about a pint of the mixture to be injected daily into the bladder. (*Albert.*)

Powders for acute cystitis.

℞ Lupulini, gr. xv.
Morphinæ hydrochlor., gr. ¼.
Sacchari albi, gr. xlv.
M. et divide in pulv. viij. Three to five daily.
(*Prof. Ultzmann.*)

For washing out the bladder in chronic cystitis.

℞ Acidi borici, ℥ss.
Glycerini, ℥j.
Aquæ destillatæ ad ℥v.
M. f. lotio. To be mixed with an equal quantity of warm water. (*Ultzmann.*)

If the catarrh is putrid and offensive.

℞ Resorcini, gr. xlv ad lxx.
Aquæ destillatæ, ℥iij.
M. f. lotio. (*Ultzmann.*)

For the solution of phosphatic deposits in the bladder.

℞ Acidi hydrochlorici fortioris, ♏iij.
Aquæ destillatæ, ℥vj.
M. f. lotio. (*Ultzmann.*)

For chronic pyelitis.

℞ Quininæ tannatis, gr. xv.
Sacchari albi, gr. xxx.
M. et div. in pulv. vj. One three times a day. (*Ultzmann.*)

For calculous pyelitis (uric acid or oxalate of lime).

℞ Sodii phosphatis, ℥j.
Sodii bicarbonatis, ℥ij.
Lithii carbonatis, ʒijss.
M. f. pulv. A teaspoonful in a pint of water three times a day. (*Ultzmann.*)

The use of glycerine in the treatment of uric acid calculi.

Several German physicians (Rosenfeld, Cuspar, Kugler, and Hermann of Carlsbad) have reported excellent results in cases of nephrolithiasis by the administration of large doses of glycerine by the mouth, the good effects being due, it is believed, to physical changes it produces in the urine. The dose given is 1 to 4 oz. dissolved in an equal quantity of water, and taken between two meals every two or three days for a period of several days. In these doses it is said to cause the urine to become somewhat oily in consistence, and the good results are attributed to its lubricating action. Another suggested explanation is that by raising the specific gravity of the urine it produces a change in the position of the calculi in the pelvis of the kidney. In 62 per cent. of cases in which it was given it either removed the concretions or relieved the pain associated with the disease.

CHAPTER III.

THE TREATMENT OF INFLAMMATORY DISEASES OF THE KIDNEYS—ACUTE AND CHRONIC BRIGHT'S DISEASE.

ACUTE BRIGHT'S DISEASE, ACUTE NEPHRITIS—Causes—Nature—Symptoms—Changes in the Urine—Increased Arterial Tension—Effusions into Serous Cavities—Uræmia—*Indications for Treatment*—Advantages of Milk Diet—Dilute Alkaline Drinks—Local Measures—Stimulation of the Skin by Hot Baths, or Hot Air or Vapour Baths, or the Wet Pack—Diaphoretics—Pilocarpine—Purgatives—Diuretics—Nitro-Glycerine—Caffeine—Treatment of certain Symptoms—Of Vomiting, of Dropsy, of Uræmia, of Cardiac Debility and Anæmia—Treatment of Convalescence.
CHRONIC BRIGHT'S DISEASE.—(*a*) *Chronic Parenchymatous Nephritis*—Origin—Symptoms—Characters of Urine—Arterial and Cardiac Changes—*Indications for Treatment*—Oxygen Inhalations—Milk Diet—Vegetable Foods—Avoidance of Animal Extracts—Drug Treatment not of great value—Diuretics—Mild Alkaline Waters—Digitalis—Caffeine—Acupuncture for Anasarca—Saline Aperients—Nitro-Glycerine—Hygienic and Climatic Treatment—(*b*) *Chronic Interstitial Nephritis*—Causes—Insidious Onset—Early Symptoms—Characters of the Urine—High Arterial Tension and Cardiac Hypertrophy—Frequency of intercurrent Affections—*Indications for Treatment*—Regiminal—Dietetic—Climatic—Medicinal.
Additional Formulæ.

ACUTE BRIGHT'S DISEASE—ACUTE NEPHRITIS.

AN acute inflammation of the kidneys may be determined by exposure to cold, by the effect of chill on the surface of the body, between which and the kidneys a very close relationship seems to exist. Exposure to cold, especially after severe muscular exertion, which makes a great call on the excretory functions of the kidneys, is a frequent cause of acute nephritis. It may also be caused by the action of toxic agents on those organs, as the toxins produced by the microbes of the specific infective fevers, and especially that of scarlet fever.

Alcoholic excesses, irritant drugs, such as turpentine, cantharides, carbolic acid, and potassic chlorate, may excite an acute congestion of the kidneys, which may run on to inflammation. It sometimes occurs in connection with pregnancy, but the precise manner in which this arises is not at present known.

The two most common causes of *acute* nephritis in England are exposure to cold and scarlet-fever.

The epithelium, the blood-vessels, and the intertubular connective tissue are affected in varying degrees of intensity in different forms of this affection, so that different writers describe (*a*) a *tubular*, (*b*) a *glomerular*, and (*c*) an acute *interstitial* nephritis. These different forms cannot be recognised clinically, and it is in the clinical aspects of disease that we are at present mainly interested.

It is difficult to say what may be the precise physical changes in the kidneys at the onset of an attack of acute nephritis, since anatomical investigations can only disclose the *post-mortem* appearances; but we may conclude that there is more or less intense hyperæmia with inflammatory exudation, containing leucocytes and red blood corpuscles, affecting especially the capillaries and the epithelium of the glomeruli. These alterations interfere with the circulation in the malpighian tufts, and seriously disturb the nutrition of the secreting tubules. Accumulations of inflammatory products—altered cells, leucocytes, and blood corpuscles—in the convoluted tubules, cause the whole organ to become enlarged and sometimes greatly swollen. The tubules are thus blocked, the vascular tufts compressed, and excretion gravely interfered with and sometimes even arrested. More or less, also, of inflammatory exudation takes place in the connective tissue between the tubules, and thus the intertubal capillary plexus is also compressed.

What are the **symptoms** attending this affection? In some cases the characteristic appearances—pallor and puffiness of the face and œdema of the ankles—are preceded by chills and rigors, together with some lumbar pain, nausea, and vomiting. Headache, constipation, and a furred tongue are also usually present.

The temperature is not always raised, and when it is it rarely exceeds 103°, and may range between that and 100°. But it is naturally to changes in the **urine** that we look for conclusive evidence of the presence of acute nephritis. The urine is usually found to be scanty (in a few cases it may be entirely suppressed), high-coloured or "*smoky*," of high specific gravity (1025 to 1030), and to contain albumen, blood corpuscles, and casts of the renal tubules, epithelial, hyaline, and blood casts. Sometimes it is of a dark red colour, from the presence of a considerable amount of blood. The excretion of urea is diminished, although the percentage in the urine passed may be high.

Diffuse anasarca, with a marked anæmic aspect of the surface, may develop rapidly, and dropsical effusions may also take place into the serous cavities. The skin is dry and the pulse hard, from *increased vascular tension*, and the second sound over the aorta is accentuated.

Symptoms of uræmia appear in some cases. It is, however, on the examination of the urine that the diagnosis mainly depends, as cases of acute nephritis may occur without anasarca.

In the nephritis of pregnancy, the first indication of its existence may be a uræmic convulsion.

A brief duration and rapid recovery occasionally attend cases referrible to chill, but cases following scarlet fever, however favourable their course, are rarely convalescent in less than a month. In such cases the dropsy, after eight or ten days, subsides, the urine increases in amount, and the albumen lessens. There is, however, a great tendency in these cases to become *chronic*. The most serious results in these acute cases are the occurrence of considerable effusions into the serous cavities and the onset of uræmia.

The *indications for* **treatment** are tolerably clear; they are:—

(1) To allay all irritation and excitement of the inflamed organs by securing to them, as far as possible, functional rest, *i.e.* by promoting the elimination of

renal excretion by other channels; (2) to endeavour to flush the obstructed tubules and clear them of inflammatory exudations; (3) to moderate the increased arterial tension; (4) to diminish the local hyperæmia by counter-irritation and derivation to the surface; and (5) to promptly treat serious symptoms as they arise, such as large effusions into the serous cavities, or the symptoms due to retention of renal excrementitious matters in the blood.

It has been said that threatened attacks of acute nephritis in scarlet fever, the evidences of which were the presence of blood colouring matter in the urine and increase of arterial tension, have been warded off by a smart saline purge.

In severe cases, with fever, pain in the back, and general dropsy, the following method of treatment should be adopted:—

The patient should be confined to bed in a room the temperature of which should not be less than 65° F., and as the proposed treatment will be directed to producing free action of the skin, he should lie between blankets and wear a thin flannel bed-gown, with long sleeves to the wrists, to avoid all risks of chill.

His diet should consist exclusively of milk and water; pure milk is often difficult of digestion, but it is less likely to be so if diluted with an equal quantity of hot water or with hot thin oatmeal gruel. Buttermilk, if it should be preferred, may be taken instead of milk, and barley water may also be freely partaken of; a little thin arrowroot is also permissible. If the patient does not object, it is desirable that these drinks should be warm.

The advantage of **milk** as a food is that it supplies sufficient albumen to compensate for the loss by the kidneys, as well as the other substances needed for complete nutrition, while it contains the minimum of waste material for elimination. It is also a non-irritating diuretic.

The milk should be drunk in small mouthfuls at a time, and not in large draughts. If drunk in the latter fashion, a sense of weight at the stomach is sometimes complained of. There can be no objection to flavouring the milk with a little tea or coffee if the patient desires it. A little weak chicken or mutton broth may also be permitted for sake of variety.

From 4 to 6 pints of fluid in the 24 hours, including the milk, will usually be sufficient for an adult.

The free use of fluids is needful in order to keep the kidneys flushed—to wash out the *débris* from the renal tubules. Water, therefore, may be drunk freely, and there is no reason why it should not be freely mixed with the milk that is taken as food, especially as it promotes its digestibility, and this will be particularly the case if some alkali be added to the water. It is a good plan to have a decanter by the bedside, filled with distilled water, containing about 10 grains of sodium bicarbonate and 10 grains of potassium citrate to the ounce, and to order a tablespoonful or two of this to be added to each cup of milk and water. We agree with Sir William Roberts that it is beneficial to give some alkali in this way, in order to lessen the acidity of the urine, and so diminish its irritating effect on the kidneys, while at the same time alkaline fluids promote the clearing of the renal tubules of inflammatory products.

Other drinks which may be permitted are weak lemonade (home made without sugar), imperial drink (made by adding 1 dram of cream of tartar and the juice of half a lemon to a pint of hot water, and allowing to cool), and whey, which may be readily made by boiling milk with a little lemon-juice or with cream of tartar, two tablespoonfuls to the pint, and straining. This may be taken freely; it is pleasant and slightly nutritious, and very useful for patients who do not like, or cannot digest, milk.

Local measures to relieve the engorgement of the kidneys often prove most serviceable; and when there is much blood in the urine, and complaint of pains in the back, they should never be overlooked. They often check threatened suppression of urine. In robust persons, 12 to 20 leeches, or a few cupping glasses, may be applied over the region of the kidneys, followed by a hot linseed poultice, which should be quickly renewed and never allowed to get cold. It too often happens that such poultices are very carelessly applied, and, to avoid this risk, it may sometimes be better, when we are not sure of our nurse, to trust to a layer of hot cotton-wool. When it seems undesirable to withdraw any blood, we may employ dry cupping. Repeated hot mustard poultices are, perhaps, as efficacious as anything, and they are easy to apply. Some physicians prefer the use of Paquelin's thermo-cautery.

In order to relieve the kidney of its eliminative functions, we make vigorous calls upon the excreting functions of the skin and intestinal mucous membrane, and, in doing this, we also favour the removal of renal congestion by diverting the blood more especially to the cutaneous and intestinal surfaces; and we thus also do our best to avoid the accumulation in the blood of retained urinary excreta, and we moderate vascular tension. When there is dropsy, we also, in this way, get rid of much of the dropsical fluid.

To stimulate the skin to increased activity, we may, in the first place, employ **hot baths,** or hot air or vapour baths, or the wet pack; but in applying either of these measures to promote the action of the skin, the patient should be freely plied with diluent drinks, of which pure water is the best, so that the blood may not be unduly concentrated by loss of water from the surface. Liebermeister advocated the use of the hot bath in the following manner: The patient is placed in the bath at about 100° F., and more hot water is added gradually until the temperature reaches 104° to 106°; he is allowed to remain in the bath from 30 to 60 minutes, then wrapped up in a warm sheet and warm blankets for two or three hours more. A profuse perspiration may usually be induced by this means. The difficulty about the bath is that it is not always easy to bring the bath to the patient's bedside; and there may be risk of chill in conveying the patient to another apartment for the purpose.

The **wet pack** may be employed as a substitute for the hot bath. The patient is wrapped round with a sheet dipped in hot water, and then covered up with hot blankets. Whitla describes the method he adopts as consisting in dipping a large, thick, double blanket into nearly boiling water, with which a few ounces of mustard have been mixed; this is left in for a few minutes, and then well wrung out by attendants, and the patient is carefully wrapped in it, all the body except the face and head. There is no danger of having the blanket too hot; the difficulty is in keeping it hot enough, owing to rapid evaporation from the large surface. The patient is then placed on a straw mattress, and covered with blankets for two hours, when profuse perspiration occurs. He is then rubbed dry, and placed between warm blankets. When in the pack he is given warm barley water, or whey, freely. A very convenient appliance for acting on the skin is the hot-air bath (Fig. 1). It is readily extemporised.

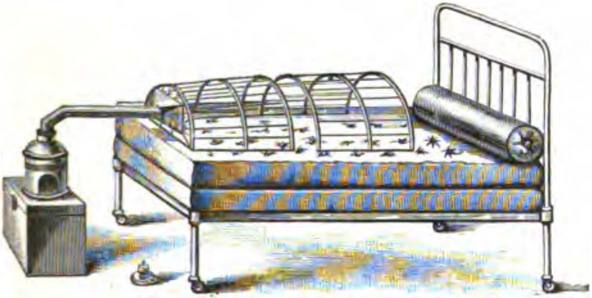

Fig. 1.—Hot-air Bath.

A spirit lamp is placed on the floor near the bed, with it a tin funnel is connected, furnished with a tube bent at a right angle, and of a suitable length to pass under the bed-clothes at the foot of the bed. The bed-clothes are tucked closely round the patient's neck. The heat given off by the lamp, and the steam formed by the combustion of the spirit, usually suffice to throw the patient into a profuse perspiration. Should, however, the skin, instead of perspiring, become hot and dry, some warm stimulating drink should be given to start the diaphoresis. A bath of this kind may be frequently repeated, and any depressing effect on the heart it may produce should be guarded against by the administration of some stimulant. The effect of these baths may often be promoted or augmented by the simultaneous use of some stimulating diaphoretic medicine, containing some vaso-dilator drug such as nitrous ether: one of the simplest and best is ½ a dram of sal-volatile, ½ a dram of spirit of nitrous ether, and 2 or 3 drams of solution of ammonium acetate, mixed with one ounce and a half of camphor water. Such a dose may be given three or four times a day. If the body temperature is high, and the pulse tension great, and it is the *commencement* of the attack, 2 or 3 minims of tincture of aconite may be added to each dose, but this drug must not be continued for more than four or five doses, on account of its depressing effect on the heart; and, when it does good, the good it does is usually immediate. Its beneficial effects are much more marked in the case of children than of adults.

But there is a drug which, when administered hypodermically, usually has an immediate and powerful effect in increasing the cutaneous transpiration, and that is **pilocarpine,** which is frequently administered for the purpose of exciting profuse diaphoresis in acute Bright's disease. Objection has been made to its use, on account of some unpleasant symptoms that have been observed to follow its employment, such as nausea, vomiting, and even collapse. Great care and discrimination should be shown in the cases in which it is administered; and, if notable cardiac weakness is known to exist, it should be withheld. The dose also should be small at first; it is better to give to an adult two doses of a tenth of a grain at intervals of fifteen minutes than to give a fifth of a grain at one dose; and the patient should be prepared for each dose by a little hot coffee.

We do not think it is a suitable drug for children, as they vary so very greatly in their capacity for tolerating certain medicines.

Free purgation is another measure adopted for the purpose of relieving the kidneys of their eliminating functions, and of removing from the blood some of the solid and toxic constituents of the urinary excretion, and so reducing vascular tension, while it also helps to carry off dropsical effusions.

If a saline purgative is used it should be given in concentrated solution, when its action will be almost wholly confined to the bowels, and will give rise to no irritation of the kidneys.

The compound jalap powder is the favourite purge in England for cases like these; from 30 to 60 grains, in a little water, may be given once or twice daily; or 2 or 3 drams of magnesium or sodium sulphate, dissolved in an ounce or two of water, may be given every morning fasting. It is rarely necessary or desirable to have recourse to the more violent purgatives, such as croton oil, camboge, elaterium, etc. In milder cases it is only necessary to give aperients to keep the bowels regularly relieved, and in children, for this purpose, an ounce or two of fluid magnesia with a teaspoonful of lemon-juice, early in the morning, is both pleasant and efficacious; or a few grains of compound scammony powder may be given each night.

It is important that the patient should not be exposed to any risk of chill during the action of the bowels. He must not therefore be allowed to get up and leave his warm room for this purpose.

Some differences of opinion have existed as to the propriety of giving **diuretics** in cases of acute nephritis. The stimulating diuretics, which act on the secreting cells of the kidneys, are certainly, in our opinion, counter-indicated, but this is not the case with those diuretics which simply favour the flow of water through the kidneys; we have already pointed out that such flushings of the renal tubules are advantageous. Of such diuretics *water* is the best; and we may usefully add to the water small quantities of such alkaline salts as the potassium citrate or the sodium benzoate, and sodium bicarbonate; the two former are believed to have the property of favouring "the conversion of the urates into less irritating and more easily excreted compounds."

The use of diuretics which act by raising the arterial tension, such as digitalis or strophanthus, must be approached with more caution; they are certainly not suitable in the early stages, but are of value when the arterial tension is low, the urine scanty, and the heart's impulse feeble. They may be employed when the stage of active engorgement of the kidneys is passed, and when the cardiac force may require raising; they then often exercise a beneficial diuretic effect. It has been suggested that in the hyperæmic stage the administration of *nitro-glycerine* or *sodium nitrite* may, by lessening the general arterial pressure, relieve the strain upon the weakened renal vessels and give them the opportunity to recover their tone.

Caffeine, which, like digitalis, raises arterial tension and so increases the flow of urine, may be substituted for it. The best mode of giving it is as a hypodermic injection in solution in sodium benzoate; from 3 to 10 grains of caffeine with the same quantity of sodium benzoate may be dissolved in a few minims of warm distilled water and used for each injection. Or it may be given by the mouth.

The advocates of *organotherapy* have reported benefit as arising from the administration of some half-cooked kidney in the patient's food, with the idea that it supplies an internal secretion, but we doubt the accuracy both of the theory and of the practice.

An efficient diuretic may often be found in a combination of potassium acetate (30 grains), infusion of digitalis (2 to 4 drams), and decoction of broom tops (1 to 2 ounces). This dose may be given every four to six hours. Potassium iodide proves a most efficient diuretic in some cases, and it does not appear to produce any irritant effect on the kidneys, while it has a decidedly beneficial influence on the cardiovascular changes. In cases tending to chronicity and attended with anæmia it may be combined advantageously with the syrup of the iodide of iron.

The **symptoms** which may require special consideration in connection with the treatment of a case of acute nephritis are the following: (*a*) nausea and vomiting, (*b*) an extreme amount of general dropsy with effusion into the serous cavities, (*c*) uræmia with convulsions, (*d*) anæmia and cardiac dilatation.

Vomiting may be to a certain extent useful in eliminating toxic substances from the blood, and should not be immediately checked; but when it is continued and exhausting we must endeavour to arrest it. For this purpose small fragments of ice may be sucked, or a mixture containing the ammonio-citrate of bismuth and dilute hydrocyanic acid may be given—a mustard plaster may be applied to the epigastrium, drop doses of creasote mixed with a little lime water may be given, or drop doses of tincture of iodine in water. The patient may, at the same time, be fed by nutrient enemata—peptonised milk being best for this purpose; should there be any difficulty in retaining this, 2 or 3 minims of tincture of opium (in *adults*) may be added to each enema.

An *extreme amount of dropsy*, which does not yield to the measures we have already indicated, must be relieved by draining away the fluid by *puncture* of the skin of the legs; we have described how this may be best carried out when dealing with the treatment of cardiac dropsy.

Effusion into the pleural cavities, if it give rise, by its amount, to serious dyspnœa, must be removed by puncture and aspiration. A large accumulation of ascitic fluid may require to be removed by paracentesis.

Uræmic symptoms—headache, drowsiness, convulsions—must be immediately encountered by appropriate measures. In acute forms of uræmia in the robust, the most striking relief to the symptoms is often afforded by the abstraction of 10 to 20 ounces of blood from the arm. This is, however, a measure which should be reserved for exceptional cases, such as persistent and severe convulsions, excessively high arterial tension, and *post-partum* cases. Leeches to the temples may suffice to relieve the uræmic headache. Chloroform inhalations may be useful to allay violent convulsions. When venesection is not practised, derivation to the skin and profuse perspiration should be induced by the hypodermic injection of pilocarpine, and the bowels should be freely acted upon by a brisk purgative. A dose of elaterium may in such cases be given, as there might be some difficulty in getting the patient to swallow a draught of any kind, whereas a dose of compound powder of elaterine (½ to 3 grains) may be thrown on the tongue and washed down with a teaspoonful or two of water. In children dry cupping to the loins may be desirable, the wet pack applied, as well as a brisk purge given.

It has been said that to excite profuse perspiration in these uræmic attacks must be injurious, by causing a concentration of the blood, unless we can at the same time ensure the free absorption of water by the stomach, or by the injection of warm water into the rectum. The best answer, however, to this objection is the frequently observed fact that patients come out of the uræmic state when, under the influence of *pilocarpine* or the wet pack, free action of the skin has been established. Much depends on the ability of the skin to take upon itself the eliminating functions of the kidneys, which, on experimental, not clinical, grounds has been doubted. If it should only allow of aqueous transpiration, then excessive perspiration might lead to a dangerous concentration of toxic substances in the blood, but when it is capable of freely eliminating the solid and toxic constituents of the urine, then its excessive action must be beneficial, as in the great majority of instances is practically found to be the case.

Again, when fluids cannot be administered by the mouth, we may compensate for the loss of fluid attendant on copious bleeding or free perspiration in uræmic cases by the subcutaneous injection of dilute saline solutions, or, as we have said, by rectal injections.

A combination of chloral and bromide of potassium may be sometimes useful in allaying nervous irritation. Jaccoud and also Carter believe that the danger of uræmic intoxication may be diminished by the inhalation of oxygen, about 10 litres three times a day. This conclusion is founded on the observation by Jaccoud, that sojourn in compressed air lessened by one-half the toxicity of the urine.

Cardiac dilatation and anæmia may call for cardiac tonics, such as digitalis, caffeine, etc., and if attended by pulmonary œdema, ether, strychnine, and even oxygen inhalations may be needed, as well as dry cupping and counter-irritation to the chest. The *anæmia* will usually extend into the period of **convalescence**, which needs to be very carefully watched in order to avoid the risk of relapse.

During this period the patient should be kept at rest, and only the gentlest exercise allowed, and he should be guarded from all possible chill and be extremely warmly clothed—flannel garments being worn next the skin. Great attention must be paid to the food, which should for a long time be restricted to milk and light farinaceous puddings. No stimulants beyond a little tea or coffee should be permitted, and only small amounts of animal food until the urine is free from albumen. Fresh vegetables, watercress, lettuce, and ripe and cooked fruits may be permitted.

An iron tonic will often prove of great service, as a teaspoonful of the syrup of the phosphate or iodide of iron after food, twice or three times a day. Some patients bear full doses of the tincture of the perchloride well; for others, who are prone to headaches, a combination of the ammonia-citrate (5 to 10 grains) with sodium bromide (5 to 10 grains) thrice daily answers better. It is often most advantageous to the patient to avoid the cold of an English winter after an attack of this kind, and to seek a warm winter health resort, where he can pass some hours daily in the open air without risk of chill. Madeira, the Canaries, the Azores, or one of the resorts in the West Indies, such as Nassau in the Bahamas, are the most suitable for these renal convalescents; but these places are too distant for most invalids, and a sheltered resort on our own South Coast will be more practicable for the majority.

Chronic Bright's Disease.

In considering the treatment of chronic Bright's disease, we must recognise two principal divisions: (*a*) *chronic parenchymatous nephritis*; and (*b*) *chronic interstitial nephritis*. It is usual to consider the lardaceous or amyloid kidney as a form of Bright's disease, but as this affection admits of no special treatment, apart from the morbid states of which it is a consequence, we shall not treat of it here.

(*a*) *Chronic Parenchymatous* (*tubal*) *Nephritis.*

This form of chronic Bright's disease either follows an acute attack or comes on slowly and insidiously. It is usually characterised by a great tendency to anasarca, and it is designated, from an anatomical point of view, the *large white kidney*. Some foreign physicians regard malaria as a common cause of this form of Bright's disease. Intemperate habits are also believed to be concerned in its causation in many cases. It is a frequent sequel of scarlatinal nephritis.

When this disease comes on insidiously, the earliest symptoms may be those of gastric dyspepsia, together with progressive debility and anæmia. The face becomes pale, and there is puffiness under the eyelids, especially marked on rising in the morning, and in the evening the ankles and feet are puffy and swollen. If the **urine** is examined it is found to be scanty in quantity, and often of a "smoky" aspect from the presence of a little altered blood, and it is often turbid from urates. The deposit it throws down on standing usually displays, on microscopic examination, the presence of tube-casts, both large and small, hyaline, epithelial, granular, and fatty; red blood corpuscles, leucocytes, and renal epithelium. There is usually an abundant deposit of albumen with heat and nitric acid. Its density in the early stages may be as high as 1020 to 1025, but as the disease advances the density of the urine becomes lower. There is always a reduction in the amount of urea. The presence of general anasarca, which is very obstinate, is a marked symptom of this form, and the dropsy may affect the serous cavities. Uræmic symptoms frequently occur. Arterial changes are common; the pulse tension is heightened, the vascular walls tend to become thickened and sclerosed; the aortic second sound is accentuated, and the heart is usually hypertrophied. Retinitis frequently occurs. Symptoms of gastro-intestinal irritation, such as vomiting and diarrhœa, are often observed. In very chronic cases it may be difficult to distinguish clinically this from the next form.

The main *indications for* **treatment** are identical with those in acute nephritis, except that we have no longer to deal with an acute renal hyperæmia. All that has just been said as to the applicability of diaphoretics, purgatives, and diuretics to the treatment of acute nephritis will apply with almost equal force to these chronic forms, the main objects of treatment being to keep the blood as free as possible from contamination by toxic substances no longer eliminated adequately by the kidneys, and to remove dropsical accumulations.

Many remedies have been suggested with the *direct* object of checking the loss of albumen in the urine, but for this purpose all the most capable authorities have been compelled to admit that we have no drug of any great value.

The temporary disappearance of albumen from the urine has, however, been noted under the influence of inhalations of oxygen, but after a few weeks of amelioration the albumen in the urine reappears, and the disease follows its usual course. It has been maintained that the most successful method of treatment of these cases hitherto adopted is the restriction of the patient to an almost **absolute milk diet.**

In the application of this or of any other method, it is, of course, scarcely necessary to say that it would be fallacious to regard the mere fact of a diminution in the amount of albumen passed in the urine as indicative of a curative effect, unless accompanied also by an improvement in the nutrition, strength, and general condition of the patient.

The advantages of milk as a food for the subjects of chronic renal disease are obvious. Although, theoretically, it contains an excess of albuminates in proportion to fats and carbohydrates, this could readily be rectified, if it were desirable, by the addition of more cream and lactose, and dilution with water. But, in actual practice, it is often found that skimmed milk, in which this disproportion is, of course, much greater, agrees better with the patient than milk containing its full proportion of cream. The great recommendation of milk in these cases is that it contains no refuse substances; all its nitrogenous constituents can be absorbed and utilised; it contains an easily digested form of fat; its lactose is diuretic; and none of the principles it contains appears capable of causing any irritation of the renal epithelium; so that not only does it not introduce into the blood any, more or less toxic, refuse materials, but it contributes to the elimination of those formed in the body. We would add that we consider its digestibility greatly increased for many patients by dilution with one-third hot water, and the addition of sodium chloride, in the proportion of 20 grains to the pint. As a variation in the monotony of milk diet, a hot *milk soup* is very useful, which may be flavoured with a little celery salt; or some shredded Spanish onion, well boiled, may be added to it. Or the milk may be semi-solidified by the addition of a little hot solution of isinglass, flavoured with lemon-peel, and allowed to cool. Indeed, by a little ingenuity, milk may be presented in a variety of forms and flavours. If the patient is content and doing well with the milk diet there is no need to change it; but this will only exceptionally be the case, and the majority will grow tired of this exclusive diet, and insist on some change; and some will not digest it satisfactorily.

In such cases we may add to the dietary some agreeable vegetable food: we may allow some toasted bread and a little macaroni, rice, or tapioca. A little fruit jelly may also be added, and in many cases, especially if the bodily nutrition seems to suffer from too restricted a diet, we may permit some addition to the nitrogenous constituents and fats, in the shape of the more delicate kinds of fish, a little chicken or white game, the yolk of an egg, grilled bacon, etc. In all cases we must look carefully to the digestive functions, and see that they undergo no serious disturbance; for we must bear in mind that any toxic substances, formed during the digestive process, may either irritate the kidneys in their elimination, or tend to poison the blood by their retention in the body.

Although, as we have said, we must not regard the decrease or increase of the amount of albumen in the urine as the *only* reliable criterion of the suitability of any particular dietetic treatment, yet it is by no means an unimportant one, and it is one which it would be most unwise to disregard; but we must, at the same time, look to the *general condition* of the patient; and, when that keeps satisfactory, and if the density of the urine is also satisfactory, we should not hastily conclude that the diet is unsuitable because rather more albumen is excreted. So, on the other hand, although less albumen may appear in the urine, if the general condition of the patient is deteriorating, and the density of the urine keeps low, we may fairly doubt the propriety of continuing a severely restricted diet. Probably no greater dietetic error has ever been so tenaciously adhered to as that of prescribing strong animal extracts and broths for all kinds of invalids; and the immense number of preparations of this kind that is still being introduced to the notice of the profession and the public seems to indicate that there is no disposition to relinquish their employment.

It should be remembered that most of these preparations have little food-value, and that their mode of preparation ensures the extraction of any toxines that may be contained in the meat. We have often seen the pulse rise ten to twenty beats, and the arterial tension increase considerably, together with the appearance of much digestive discomfort, after the patient has partaken freely of some of these meat extracts. The soluble nitrogenous extractives they contain are in a condition to pass directly into the blood, and so to at once reach the kidneys, which they can scarcely fail to irritate; while they are calculated seriously to intensify the risk of uræmia. They should be strictly excluded from the dietary of the albuminuric.

Grainger Stewart, while he recognised the great value of milk as the most suitable food for these cases, was disposed to depart somewhat from the exclusive milk diet, and to allow a small proportion of white meat, pudding, and fruit to be added to the dietary. Some difference of opinion exists as to the suitability of fish for the albuminuric. Senator recommends it; but Lépine and some other French authors think it sometimes increases the amount of albumen in the urine. As we have pointed out elsewhere,* "farinaceous foods, fish, vegetables and fruits, together with milk, butter, cream, and other fats, afford all that can be needed for the nutrition of the body," and a careful selection from this wide range should afford an ample variety of diet for our patients.

There is not very much to be said in favour of drug treatment in chronic Bright's disease, save to meet indications presented by particular symptoms or states which may arise during its progress. The measures appropriate to the treatment of uræmia, of dropsy, and of certain other symptoms which may occur in the course of chronic, as well as acute, cases, have been considered when discussing the treatment of the latter, and we have little to add to what was there set forth. Diuretics may be more freely used in chronic cases; and the use of mild alkaline waters may be especially commended for the purpose of exerting a diuretic action without causing renal irritation. A scanty secretion of urine from cardiac asthenia indicates the use of cardiac tonics, and digitalis may, in such cases, be found a valuable resource. The tincture, in doses of 10 to 15 minims twice a day, often advantageously combined with iron, is the best preparation. As Lépine has pointed out, it is as well in these cases to give this drug only on alternate days, or only on every third day, so as to allow of sufficient time for its elimination. Caffeine is also a good cardiac tonic and diuretic in these circumstances, and may be administered hypodermically up to 15-grain doses dissolved in sodium benzoate. Strophanthus and squill are to be avoided, as irritating to the kidneys. Grainger Stewart commended as a diuretic a combination of scoparius, digitalis, and potassium acetate; and he did not object to juniper and copaiba in the later stages. He considered nux vomica assisted their action. He also found a combination of iron and arsenic of great service.

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* *See* the author's "Food in Health and Disease," part ii., chapter xi., for a full discussion of this subject.

Symptoms of intercurrent renal congestion, such as the appearance of a certain amount of blood in the urine, should be met by counter-irritation over the loins, and the administration of jaborandi or pilocarpine.

Draining off the fluid by Southey's tubes, taking care that the skin and the tubes are rendered thoroughly aseptic, is the best means of removing great and general dropsical accumulations; or a number of punctures with a sterilised needle may be made, the needle being freely moved about before withdrawal, over the dorsum of the foot, the ankle, and the leg, after which the leg should be wrapped up in warm, moist flannel, and allowed to drain. Raising the head of the bed by blocks of wood is practised by some in order to promote the draining away of fluid. Large peritoneal accumulations will require to be removed by tapping.

The regular administration of saline aperients is of great importance, for the purpose of guarding against the retention of toxic substances in the blood, moderating vascular tension, and preventing the occurrence of uræmic symptoms; a full dose of white mixture (magnesium sulphate and carbonate), the first thing in the morning, is, perhaps, the best. It may, if necessary, be preceded by an aloes-and-soap pill at night. Potassium bitartrate aud the compound jalap powder are also good aperients in these cases.

Numerous drugs have been administered in this disease with the object of diminishing the excretion of albumen; but the loss of albumen is not in itself so serious a matter, and attempts to reduce this loss by drugs are neither needful nor advisable.

Nitro-glycerine has been strongly recommended for the purpose of relieving giddiness and headache and other symptoms of high arterial tension, for which blood-letting has also been proposed. From ½ a minim to a minim of the 1 per cent. solution should be given every hour or two for five or six times, and then less frequently.

But in the milder chronic cases of this form of Bright's disease it is on the judicious use of general hygienic measures that the chief reliance must be placed. The care of the general health, the regulation of digestion and alvine excretion, the promotion of the excretory functions of the skin, the regulation of clothing and exercise, the selection of a suitable climate, all these are of the greatest importance in promoting the restoration of such patients to health or in preventing the advance of the disease.

Of the food suitable to these cases we have already spoken, and on this point we have only to add that as improvement in health is established, a slow and gradual return to the ordinary diet may, with careful supervision, be permitted. Symptoms of dyspepsia are best treated by almost complete abstinence from food for a short time, a little thin peptonised oatmeal gruel only being taken; buttermilk has been found to be well borne in some of these dyspeptic states. Whey made with lemon-juice is also an agreeable, slightly nutritious drink. Suitable aperients must of course be given. Intestinal antiseptics may occasionally be of service when symptoms of flatulence and intestinal indigestion are prominent. Half a minim of creasote or a grain of thymol, in a pill with powdered soap, may be ordered three or four times a day when food is taken.

The functions of the skin must be promoted by hot baths—the safest and best is a very hot bath (as hot as can be comfortably borne), with a bag of bran wrung out in it, at bed-time; the patient, after a quick rub-down, should be wrapped up in a flannel dressing-gown or night-shirt, and at once sent to a warm bed. Dickinson * suggests a Turkish bath every week or ten days—or a hot-air "leg-bath" (often more obtainable and convenient), as remedial or preventive of the headache, vomiting, etc., resulting from blood

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* Allbutt's "System of Medicine," vol. iv., p. 403.

contamination. Dry friction of the skin in a thoroughly warm room should be prescribed on getting up in the morning, and in cold weather a very liberal amount of rest in bed should be insisted upon. An albuminuric patient in the English climate, in winter, may very profitably pass much of his time in bed, or in one warm room. Prof. Semmola, of Naples, confined such patients during winter to one large room, the temperature of which was kept constantly between 60° and 68° F.

Warm clothing should, of course, be insisted upon; woollen garments should be worn next the skin, and a broad woollen band worn round the loins is an additional protection.

It is a great advantage to such patients to be able to change to a **more genial climate** in winter and spring.

It is common to recommend such patients to winter in one of the resorts on the Riviera, or in Algiers or Egypt, and although these resorts may be better than any place within English shores, they are not the very best climates for the albuminuric, as they all lack that equability of temperature which is so beneficial to them. The best climate for the subjects of chronic Bright's disease is a somewhat humid, warm, equable one, which will exercise a decided influence in promoting the activity of the skin. Madeira, Orotava, the Azores, are the most accessible of such climates to English patients, but the most perfect resorts of this kind are to be found in the West Indies, and surprising benefit often follows a prolonged residence there.

(*b*) *Chronic Interstitial Nephritis.*

This is the form of chronic Bright's disease which is associated with the small, contracted, cirrhotic, "gouty" kidney, together with general arteriosclerosis and cardiac hypertrophy. Its causes are chiefly gout, lead-poisoning, and alcohol. Its occurrence in early life is rare; it is unusual to meet with a typical case under 30; it is most common between 40 and 60 years of age, less so between 60 and 70, and rare after the latter age. It is more frequent in males than in females, in the proportion of about 2 to 1.

This disease is always insidious, and is often attended with much obscurity at its commencement, while its course is characterised by extreme slowness. The disease may exist in an advanced degree, and the patient yet present great bodily and mental power. The earliest symptoms are usually those of disturbed general health. There is a sense of lassitude and weariness, the patient is sleepless, and complains of having to get up once, twice, or oftener, during the night, to pass water. The tongue is generally dirty, and the digestion is disturbed; there is a tendency to dyspnœa on exertion; headache and troubles of vision are also complained of.

The **urine** is generally increased in quantity, and there is increased thirst. It is pale, clear, and of low density, 1005 to 1012. It rarely contains much albumen, and it requires careful and delicate testing to discover it; it may occasionally be entirely absent, especially in that passed in the early morning. Tube casts are not always present, but usually a few hyaline or granular casts may be found. The amount of urea is often, but not always, diminished. The pulse is hard from increased arterial tension, and the wall of the artery is commonly thickened. Continuous high arterial tension is one of the earliest and most important symptoms of this form of chronic Bright's disease. The presence of cardiac hypertrophy is another almost constant feature; the left ventricle hypertrophies to overcome the resistance in the arteries. The first cardiac sound at the apex may be re-duplicated, but more commonly the second sound in the aortic area is strongly accentuated.

Intercurrent affections of other organs are common. Sudden œdema of the glottis; pleural effusions; sudden œdema of the lungs; nocturnal dyspnœa and renal asthma; acute pneumonia, pleurisy, bronchitis; uncontrollable vomiting; severe diarrhœa; *cerebral hæmorrhage;* visual troubles, retinal hæmorrhage, retinitis, etc., may occur, cerebral hæmorrhage and retinal changes being especially common. Epistaxis has often been noted as an early premonitory symptom. *Dropsy* is rare, and when it occurs it is usually either due to cardiac failure in the advanced stages, or to the "supervention of *parenchymatous nephritis* upon antecedent cirrhosis." Eczema is common.

The chief clinical features which distinguish this from the preceding form of chronic Bright's disease are its slower progress and usually insidious onset, the small amount of albumen in the urine, the infrequency of general dropsy, and the constant coexistence of cardio-vascular changes.

The following *indications for* **treatment** are deducible from the preceding brief description of the general characters of the disease :—

1. In the early stages, to relieve the heart, arteries, and kidneys from further strain and irritation.
2. When there are evidences of greatly increased arterial tension, to lessen it.
3. To strengthen and support the heart when signs of dilatation and failure appear.
4. To promote the elimination of toxic substances, especially when symptoms of uræmic intoxication supervene.

1. The treatment in the early stages must be mainly regiminal and dietetic. An *exclusive milk diet* has proved less satisfactory than in the preceding form; at the same time the diet should be regulated on the principle of giving those foods which will leave but little nitrogenous waste to be eliminated. Milk and farinaceous foods, in light and digestible forms, with well-cooked fresh vegetables, and such fresh salads as lettuce and watercress, should comprise a large part of the daily dietary. Animal food, to

the extent of 3 or 4 ounces of well-cooked meat, may be taken once a day, and this should rarely be exceeded; but we must not be too absolute, and in all cases we must study the individual digestive capacity, and the special nutritive needs of the constitution.

All alcoholic drinks must, as a general rule, be forbidden. Tea, coffee, and cocoa may be permitted. Weak alkaline mineral waters should be drunk freely, in order to maintain as active elimination as possible by the kidneys, and, by diminishing the acidity of the urine, to render it less irritating to those organs. Vals, Vichy, Apollinaris waters are all useful for this purpose; they may be taken mixed with milk, or with a little added lemon-juice. When there is much dyspeptic trouble, with a dirty tongue and foul breath, it is a good plan to give a small tumblerful of warm Apollinaris water half an hour or an hour before the principal meals.

It is *most important* to see that there is free daily evacuation of the bowels. No harm can arise, but much good, from a little free purgation occasionally; at any rate, constipation should never be allowed to go unrelieved. A dose of Apenta water or of Carlsbad or other aperient salts, or of the familiar "white mixture," should be taken if necessary every morning, and this may be rendered from time to time more effective by an aloetic pill the night before. The functions of the skin should be promoted by a daily tepid bath, followed by brisk friction of the surface. All mental excitement and business strain or worry should be, so far as possible, avoided. Gentle exercise in the open air, in fine weather, is advantageous, but the patient must be warned against all violent or excessive exercise, which is most injurious, as it not only increases the amount of nitrogenous waste to be secreted, but it throws additional strain on the hypertrophied heart and sclerosed arteries, and increases the risk of vascular rupture always, more or less, imminent in these cases.

In order that the patient may have the advantage of the decidedly tonic influence of gentle exercise, or of sitting out a good deal in the open air, a residence during winter in a more favourable climate than that of Great Britain is indicated. We have already referred to such climates. Osler recommends southern California as a permanent residence for American patients.

So far as medicines are concerned, it is doubtful if we can do much more in order to respond to this first indication than give, as we have pointed out, mild alkaline diuretics and regular aperients.

Many physicians, however, have a firm belief in the usefulness of **potassium iodide** in checking the progress of arterial sclerosis. Profs. Bartels, Germain Sée, and Semmola have strongly supported its use, and the latter has prescribed the following as a drink for such patients: potassium iodide, 15 to 20 grains; sodium phosphate, 30 to 45 grains; sodium chloride, a dram and a half; to be dissolved in a quart of drinking water.

There are certain cases of albuminuria, not very rare, in which gout and constitutional syphilis are combined; in such cases the use of potassium iodide is attended with great improvement.

2. To lessen excessive arterial tension, potassium or sodium iodide will certainly often prove most useful. It has been well pointed out that in our efforts to correct excessive high tension we must not fall into the opposite error of greatly lowering the tension, for, in that case, the risk of effusion into serous cavities is greatly increased; but we should aim at a happy medium. The action of the skin should be promoted by hot baths (some take objection to hot-air baths as likely to induce uræmia), followed by envelopment in blankets, as already mentioned. The food should be very light, and a saline purge should be frequently given.

Nitro-glycerine is now largely employed to relieve vascular tension; 1 minim of a 1 per cent. solution may be given three times a day, and the dose increased according to the tolerance of the patient for this drug, which varies very greatly. It not only relieves the arterial tension, but it coincidently relieves the dyspnœa, the headache, and the dizziness.

3. Anæmia, and a tendency to cardiac dilatation and failure, are often present in the more advanced stages of the disease. For the anæmia, when that is a prominent symptom, iron is needed. It may often be wisely combined with digitalis. Weir-Mitchell has found large doses of the tincture of perchloride of iron, 30 to 60 minims three times a day, very beneficial in such cases, and he considers it an important means of reducing arterial tension.

We entirely agree with Dickinson that iron should not be administered as a matter of routine, as it often seems to be, but only when an obvious condition of anæmia exists.

Strychnine is also an excellent cardiac tonic in these cases: it may be given in combination with digitalis and iron, or it may be injected hypodermically (5 minims of liquor strychninæ).

4. We have already, in preceding sections, dwelt on the appropriate treatment of uræmic manifestations. In the cases we are now considering, we perhaps more frequently meet with the slighter manifestations of the approach of these ultimate troubles, such as headaches, palpitations, cramps, and occasional attacks of nocturnal dyspnœa (renal asthma). In these, as in other cases, to promote elimination is the paramount indication; the production of free purgation and copious perspiration, by the means already pointed out, should be our first care. Pulmonary apoplexy and hæmoptysis call especially for saline purges, and magnesium sulphate is the best. To relieve arterial tension we may use nitro-glycerine; this also, and nitrite of amyl, may be used to relieve the attacks of uræmic dyspnœa; inhalations of chloroform will also be useful to relieve this condition, as well as

the severe uræmic convulsions. Chloral may also be given to allay uræmic convulsions, either by the mouth, or, when this is not practicable, by the rectum. We have already pointed out the utility of blood-letting in certain cases.

Caffeine will often relieve the headaches and vomiting of uræmia. Dr. West * is somewhat enthusiastic about the value of nitrate of pilocarpine in these cases, given in small doses by the mouth twice or thrice daily. He has found it relieve the headache, vomiting, irritability of temper, and nocturnal restlessness. This writer also urges the trial of *renal extracts*, on the hypothesis that the kidneys may produce an internal secretion; he states he has tried them in a few cases, and found their use attended with an increase in the amount of the urine and an improvement in the general condition. We do not ourselves anticipate any considerable therapeutic gain in this direction.

In a severe paroxysm of renal asthma Dr. Kirk, of Glasgow,† found the withdrawal of 15 ounces of blood by venesection was followed by immediate and complete relief.

Delirium and restlessness may be best relieved by the administration of chloral, or chloralamide combined with sodium bromide. It used to be taught that there was great risk of inducing fatal cerebral symptoms if opium or morphine were given to patients with chronic Bright's disease; and we have ourselves seen a rapidly fatal result follow the administration of a small dose of opium, given to relieve the nocturnal dyspnœa in a case of this kind. Fagge has borne testimony to the like effect,‡ and Dickinson says: "Opium and its derivatives should be rigidly avoided in the convulsive and *every other* stage of organic albuminuria."§ However, Osler, Mackenzie, Loomis, and others maintain that it is quite safe and proper to give morphine in uræmic states. Osler says that "for the restlessness and delirium, morphine is indispensable." We cannot help fearing, nevertheless, that, if opium and morphine are used freely for this purpose, the restlessness of uræmia will occasionally be relieved by the repose of death. We should sanction their use with extreme reluctance, and then only in very small doses, unless they are employed simply to promote euthanasia! Hyoscine hydrobromide we should regard as a safer drug, $\frac{1}{200}$ gr. given hypodermically.

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* "Granular Kidney," pp. 161 and 162.
† *Brit. Med. Journal*, June 9th, 1894.
‡ "Practice of Medicine," vol. ii., p. 499.
§ Allbutt's "System of Medicine," vol. iv., p. 404.

ADDITIONAL FORMULÆ.

In acute Bright's disease.

℞ Infusi jaborandi (1 in 45) ad ℥vj.
Syrupi aurantii, ʒv.

M. f. mist. A tablespoonful every hour or two. (*Bamberger.*)

For anasarca in acute Bright's disease (after the acute symptoms have subsided).

℞ Tincturæ ferri perchloridi, ʒvij.
Liquoris ammonii acetatis, ℥iij.
Aquæ chloroformi, ℥vj.

M. f. mist. A tablespoonful in a wineglassful of water every four hours. (*Whitla.*)

Diuretic in acute Bright's disease.

℞ Potassii citratis, ℥ss.
Infusi digitalis, ℥j.
Aquæ, ℥j.

M. f. mist. Two teaspoonfuls in aërated water every three hours.
(*Prof. A. H. Smith.*)

As a diuretic in Bright's disease.

℞ Tincturæ digitalis, ʒv.
Vini scillæ, ℥jss.
Spiritus ætheris nitrosi, ℥ij.

M. A teaspoonful in water every three or four hours.
(*Millard.*)

In chronic Bright's disease.

℞ Potassii iodidi, gr. xv.
Sodii phosphatis, gr. xxx.
Sodii chloridi, gr. lxxv.
Aquæ ad ℥xx.

M. f. mist. To be taken in the twenty-four hours.
(*Semmola.*)

Tonic and diuretic.

℞ Tincturæ ferri perchloridi, ʒv.
Acidi acetici, ʒss.
Liquoris ammonii acetatis, ℥v.
Curaçoæ, ℥ij.

M. A teaspoonful, in water, thrice daily. (*Da Costa.*)

Hydragogue purge in Bright's disease.

℞ Potassii tartarati, ʒj ad ʒjss.
Jalapæ pulveris, gr. viij.
Cambogiæ pulveris, gr. j.

M. f. pulv. To be taken night and morning. (*Baskell.*)

In Bright's disease.

℞ Pilocarpini hydrochloridi, gr. j.
Sacchari lactis, gr. x.

M. et div. in pul. x. One three times a day. (*Baskell.*)

Tonic pills in chronic Bright's disease.

℞ Ferri sulphatis, gr. lxxv.
Sodii bicarbonatis, gr. lxxv.
Extracti taraxaci, q.s.

M. et div. in pil. lx. Take three pills night and morning. (*Bamberger.*)

In uræmia.

℞ Acidi benzoici, gr. vijss.
Sacchari albi, gr. lxxv.

M. et divide in pulv. vj. One every two hours. (*Bamberger.*)

Part VII.

DISEASES OF THE NERVOUS SYSTEM.

CHAPTER I.

THE TREATMENT OF DISEASES OF THE BRAIN AND ITS COVERINGS.

TUBERCULAR MENINGITIS.—Its Nature and Seat—A Bacillary Infection—*Symptoms*, in Children; in Adults—*Treatment*, to be of any use, must be applied early—Potassium Iodide—Iodoform Ointment—Mercurial Inunction—Antipyretics—Surgical Treatment.

SIMPLE MENINGITIS.—Causes—Symptoms—Indications for *Treatment*—Sedatives—Trephining—Anti-syphilitic Treatment—Cold Applications—Antiseptics in Infective Cases—Antipyretics—Diet.

APOPLEXY (*Cerebral Hæmorrhage, Embolism and Thrombosis*).—Nature of the Apoplectic State—Its Causes—Hæmorrhage from Arterial Degeneration—Relation to Chronic Renal Disease—*Symptoms*—*Treatment* in the Attack—Indications For and Against Blood-letting—Purgatives—Management of the Stage of Reaction—Use of Hæmostatics, Ergot, etc.—Syphilitic Cases—Embolic Cases—Treatment on Recovery from the Attack—Treatment of HEMIPLEGIA—Of Muscular Rigidity and Contractions—Use of Electricity—Diet and Regimen—Thermal Treatment—Preventive Measures—Surgical Proposals.

CEREBRAL TUMOUR.—Different forms of Intracranial Tumours—Etiology—Symptoms—Course—*Treatment*—Anti-syphilitic Measures—Cases suitable for Surgical Operations—Trephining as a Palliative Measure—Lumbar Puncture—Symptomatic Treatment. Additional Formulæ.

THE scope for active therapeutic intervention is very limited in many diseases of the central nervous system; and, as our main object in this work is to deduce *indications for treatment* from a consideration of the nature, causation, and phenomena of disease, we shall confine ourselves, in this chapter, to a brief survey of those affections only which admit of remedial interference or management on the part of the *physician*.

We shall also have to assume that the diagnosis, which, in some forms of these diseases, may necessitate a long and detailed examination, and a careful analysis of a complex group of symptoms, has been accurately made.

In the first place we propose to consider the treatment of the most frequent and most fatal of those affections, viz.,

TUBERCULAR MENINGITIS.

This disease, at one time commonly but wrongly described under the name of "*acute hydrocephalus*," from the fact that an accumulation of sero-purulent fluid in the ventricles of the brain is a frequent consequence of the affection, is really an inflammation of the membranes of the brain, due to **infection** by the *tubercle bacillus*, combined in many cases with infection by the streptococcus and staphylococcus.

The deposition of tuberculous nodules, surrounded by inflammatory exudation, is more abundant at the base of the brain than elsewhere; and from this situation it may extend, more or less widely, over the convex surface of the brain, and along the pons and bulb to the upper part of the spinal canal. It also extends along the choroid plexuses into the ventricles. The fluid in the ventricles is increased, and its character altered; and the surrounding brain substance is often softened and nearly diffluent.

Meningeal tubercle rarely occurs independently of some other local tubercular lesion, or apart from general tuberculosis. The causal relations of this disease therefore fall under those of tuberculosis generally.

The chief symptoms of this disease, as observed in children, are the following: After two or three weeks, or longer, of what are regarded as *premonitory* symptoms, such as emaciation, restlessness, loss of appetite, disordered bowels, peevishness, languor and dulness, and sometimes headache and drowsiness, the symptoms of the onset present themselves; the earliest being usually vomiting, then convulsions, and then severe headache, so severe, at times, that the child, while putting its hand to its head, utters a short, sudden cry, the "hydrocephalic cry," or he may go on screaming continuously. There is constipation, and usually a furred tongue. The temperature commonly fluctuates between 101° and 103°; and the pulse, at first quickened, may become irregular and slow. The pupils are often unequal or contracted. This "*stage of irritation*" is followed by a "stage of pressure." There is loss of consciousness; frequent grinding of the teeth; pupils dilated and insensible; there is general loss of muscular power, and evidence of paralysis of one or more of the cranial nerves may appear, as ptosis and squint. Optic neuritis is frequently revealed on ophthalmoscopic examination. Notable abdominal retraction is observed in this stage. Irregularities in the pulse and respiration are common. Finally, the coma and paralysis increase; convulsions and spasmodic muscular contractions, especially of the muscles at the back of the neck, are frequent, causing retraction of the head, and regarded as indicating a posterior basal form; and a general typhoid state sets in, with dry tongue, rapid pulse, and low delirium. Remarkable subnormal temperatures have been noted in this stage, and occasionally high ones, 106° to 107°. Now and then a remarkable but brief remission in the serious symptoms takes place, and false hopes of recovery are excited.

In *adults*, the onset is usually gradual and insidious; but the acute invasion may be very quickly fatal. Occasionally some local paralysis, as of the facial nerve, or hemiplegia, may be one of the first symptoms.

The occurrence of violent delirium is regarded as indicating extension of the tubercular infection to the convolutions of the upper surface of the brain.

The first question which arises in regard to the **treatment** of tubercular meningitis is this: Are we to consider this disease as necessarily and inevitably fatal; or may we entertain the belief that recovery is possible? Cases, few in number it is true, have been reported in which all the symptoms of this affection were undoubtedly present, and yet the patients recovered; and in two or three rare instances the opportunity for subsequent post-mortem examination has proved that the diagnosis of the nature of the original attack was correct.* Still, perhaps the greater number of authorities believe this to be an incurable disease. Osler says, "I have neither seen a case which I regarded as tuberculosis recover, nor have I seen post-mortem evidence of past disease of this nature." Niemeyer is more hopeful; he says, "Even excepting the cases where the diagnosis was somewhat uncertain, there is no doubt that recovery has occurred." Dujardin-Beaumetz maintained the same view, and quoted, in support of this opinion, a case that was under his own care, in which, during the acute attack, ophthalmoscopic examination by Meyer revealed the presence of tubercles in the choroid. This man made a complete recovery.†

All physicians are, however, agreed that, if therapeutic intervention is to be of any service, it must be during the earlier stages of the malady; and that there can be no chance for curative measures when extensive inflammatory exudation and alteration of the membranes and brain substance have taken place.

The prophylaxis of this form of tuberculosis in the children of tuberculous parents falls under the same considerations as have already been dwelt upon when treating of the prophylaxis of phthisis. Especial attention should be paid to the presence of tuberculous glands in the neck, which may have to be removed as a precautionary measure, if they resist the usual hygienic and medicinal measures.

Of the remedies that have been suggested as especially applicable to the treatment of tubercular meningitis, **potassium iodide** stands foremost. So careful and cautious an observer as Niemeyer believed he had seen two cases recover under its administration. He recommends that it should be given in large doses and for a long time. In children we may give, according to the age, from 1 to 5 grains three or four times a day, and in adults as much as 10 to 15 grains. Niemeyer noted that in the cases in which recovery followed its use there was a very extensive iodine eruption and an iodine catarrh of the nose, and that these signs of iodism were absent in the non-successful cases.

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* *See* Fagge's "Practice of Medicine," vol. i., p. 646.

† "Clinique Thérapeutique," vol. iii., p. 248.

We have always thought it somewhat remarkable that whenever the administration of potassium iodide leads to the cure of disease, the idea of syphilis instantly springs to the minds of most physicians. This is surely a sign of singular narrowness of view. If potassium iodide is so remarkable an antagonist to the syphilitic poison, and supposing syphilis to be caused by a pathogenitic microbe, why should it not act similarly towards some others? Why should we assume that it *can* only counteract syphilitic infection? Why may it not be, in circumstances (at present unknown) particularly favourable to its action, an efficacious antidote to tubercular infection? A syphilitic node melts away and disappears under its use; why not a tuberculous nodule? The answer, of course, to this is, that tuberculous nodules, in other situations, are not observed to disappear under the influence of potassium iodide. This is true in a certain sense, but it is not true *universally*, because this drug has not been tried in a sufficient number of cases to warrant the conclusion that it might not, under certain conditions especially favourable to its action, lead to their disappearance. Mercury, preferably applied by inunction, is a favourite remedy. A dram of the mercurial ointment may be applied to the abdominal surface on a binder daily. Internally the perchloride may be given in doses of $\frac{1}{16}$th of a grain in combination with 3 or 4 grains of potassium iodide.

Reports have been published of cures of this disease following the inunction of iodoform ointment, and in an affection which is generally so fatal, a suggestion of this kind should surely be given a fair trial. Whitla* relates a case, the daughter of a hospital nurse, who was believed to be dying from tubercular meningitis, and "after profound coma and squint had lasted several days" he caused "a quantity of mercurial ointment" to be rubbed in. "As a free and copious secretion of saliva poured out of the mouth some hours afterwards, the patient opened her eyes after a short time, and rapidly gained consciousness and made a speedy recovery." It is worth remarking that just as notable *iodism* occurred in Niemeyer's successful cases with potassium iodide, so notable *salivation* occurred in Whitla's successful case with mercurial inunction. Our views as to the curability of tubercular peritonitis have undergone a remarkable change; it may be that those entertained with regard to tubercle of the meninges are destined also to great modification. Hot sponging, or the application of one or two leeches, has been found to give relief to the pain in the head.

For constipation small doses of castor oil or of grey powder, or enemata, may be required; and for the convulsions a combination of chloral with bromides is useful. The administration of food is often attended with difficulty, and it may be necessary to resort to nasal or rectal feeding.

A proposal to treat surgically tubercular meningitis, on the same lines as those adopted in the treatment of tubercular peritonitis, has been seriously entertained by Senn, of Chicago, and Keen, of Philadelphia The former would tap with a small trocar, under strict antiseptic precautions, and inject 2 drams of a 10 per cent. iodoform glycerine emulsion, "practically the same treatment which has proved so successful in tuberculosis of the joints." Keen would open the skull, tap the ventricles, irrigate and drain.† Puncturing the subarachnoid space between the third and fourth lumbar spines and evacuating the fluid has been attempted in this country and in Germany, and in the latter country some success has been reported from this operation, but the results cannot be said to have been very encouraging. The measure may, however, be of use for diagnostic purposes, as tubercle bacilli have been found in the fluid withdrawn. Puncture in the occipital region has also been performed.*

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* "Dictionary of Treatment," p. 516.

† Hare's "System of Practical Therapeutics" (new edition), vol. ii., p. 725.

Such are the chief points to be noted in the special treatment of tubercular meningitis; its *general* treatment must be conducted on the same principles as apply also to non-tubercular forms, which we propose, in the next place, to briefly examine.

SIMPLE MENINGITIS.

So-called simple meningitis may arise in a variety of circumstances; the majority of cases are now commonly referred to various forms of bacterial infection, *i.e.* (a) *diplococcus pneumoniæ*, such cases occurring either as a complication of lobar pneumonia, or infective endocarditis, or even as a primary infection; (b) the *streptococcus*, most frequently associated with the preceding, and the *staphylococcus;* (c) the *diplococcus intracellularis*, the characteristic organism of *epidemic cerebro-spinal meningitis*, a modification of which is found in posterior basic meningitis (Still), etc. Some of these infections may arise through traumatism and in chronic disease of the bones of the skull, such as syphilitic caries and necrosis (apart from disease of the cranial bones, syphilis seems capable of exciting meningitis). Diseases of the internal ear thus lead to meningitis or to cerebral abscess. It is sometimes an extension of the infection of erysipelas of the scalp. Exposure, with the head unprotected, to strong sun-heat, as well as excessive study, have been put forward as causes. Cases occasionally occur, not referrible to any of the foregoing causes, which have been, on that account, termed *idiopathic.*

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* Allbutt's "System of Medicine," vol. vii., p. 488.

The **symptoms** of the non-tubercular forms of meningitis bear a general resemblance to those of the tubercular variety; those most commonly present are severe and continuous headache, delirium, rigidity, and spasm or twitchings of the muscles, convulsions (not so common as in the tubercular form), stiffness and retraction of the muscles of the neck, vomiting (frequent in the early stage), constipation, optic neuritis (when base is involved). Local paralysis from lesions to nerves at the base may be present, such as ptosis, squinting, facial palsy, etc. The pupils, contracted in the early stage, become, later on, dilated or unequal. There is usually pyrexia, and the temperature may rise to 103° or 104° F. The non-tubercular form is not considered so hopeless and necessarily fatal as the tubercular form.

The first indication for **treatment** is to endeavour to relieve the severe headache and to allay cerebral excitement.

The patient should be put into a darkened, quiet, airy room, in a comfortable bed, with his head raised; his bowels should be at once freely opened by a few grains of calomel and a saline purge, which may be advantageously repeated from time to time. To check vomiting in adults, an effervescing mixture, with an excess of sodium bicarbonate, and 10 grains of sodium bromide and a dram of cherry-laurel water in each dose, should be given every three or four hours, and the patient may also suck fragments of ice. In vigorous children a leech or two behind the ears will certainly do no harm, and may help to relieve the headache. The head should be shaved, or the hair cut short, and cold continuously applied, either by means of Leiter's tubes or a well-adapted ice-bag. Mustard plasters to the nape of the neck have been found to relieve pain and restlessness. Besides the sodium bromide in the above mixture some additional sedative to the nervous system may be useful; small doses of morphine may be injected hypodermically ($\frac{1}{24}$ to $\frac{1}{6}$ grain in the adult), or enemata of chloral (15 to 45 grains), dissolved in water with an equal quantity of potassium bromide may be given, or chloroform inhalations may be of use to relieve pain and allay convulsions. Frequent small doses of antipyrin or exalgin may prove useful in relieving pain in the head; paraldehyde has been stated to be valuable as a sedative in traumatic and chronic alcoholic cases. If the attack has arisen in connection with chronic ear, nose, mouth, or orbital disease, opening the mastoid or frontal sinuses may reach the sources of the infection.

Lees and Barlow have reported several instances of recovery, in cases of young children, where the diagnosis has been doubtful between otitis and basic meningitis, following puncture of the tympanic membranes by an aural surgeon.*

Lumbar puncture made by passing a hypodermic needle into the sub-dural space between the laminæ of the third and fourth lumbar vertebræ and withdrawing some of the cerebro-spinal fluid has not yielded the good results expected of it, and must be regarded as chiefly useful for diagnostic purposes. Even if there is no reason for suspecting a syphilitic taint, we should give potassium iodide freely, and order mercurial inunction.

The authors just quoted also consider they have seen "decided benefit follow the vigorous administration of mercury," and that potassium iodide in large doses is "occasionally of distinct service." Even to young infants 1 to 3 grains of potassium iodide may be given every two hours. The best way of giving mercury is by inunction; $\frac{1}{2}$ a dram of the ointment of the oleate of mercury may be rubbed in twice a day, and at the same time a grain of grey powder given three times a day.

Some German physicians have strongly advised cold affusion, especially in the comatose stage; the patient's head having been brought over a receptacle by the side of the bed and supported there, cold water is freely poured over it. This measure is frequently attended by a temporary restoration to consciousness, but as it only lasts a short time it is of questionable advantage. When meningitis arises in connection with such infectious diseases as scarlet fever, diphtheria, influenza, and the like, Dr. C. K. Mills * suggests that too little attention "is given to the use of agents which are calculated to combat the organisms in the blood and to change the soil in which they flourish. The administration of large doses of such remedies as bicarbonate of potassium, salicylate of sodium, gaultheria, etc., might be successful in preventing the development or limiting the progress and destructive after-effects of an otherwise severe meningitis."

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* Allbutt's "System of Medicine," vol. vii., p. 556.

If it is thought desirable to administer antipyretics to reduce the temperature, we consider a combination of quinine (the hydrobromide) and phenacetin the best; 1 to 3 grains of each may be given, in infective cases, every two or three hours; the patient should at the same time be sponged with cold or tepid water. But in the earliest stage, in children, we prefer a few small doses of tincture of aconite or of aconitine for this purpose. The diet in these cases should be of the simplest; milk mixed with iced water is the best food. In the later stages, with much general depression, beef tea, wine, and other stimulants and restoratives may be called for. Rectal feeding will be necessary when it is not possible to give food by the mouth. Convalescence in those rare cases that recover must be watched carefully, and every possible care taken to avoid excitement and to maintain a long period of absolute repose; suitable tonic remedies may, after a certain time, be needed.

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* Hare's "System of Practical Therapeutics" (new edition), vol. ii., p. 721.

APOPLEXY.

(*Cerebral Hæmorrhage, Embolism, and Thrombosis.*)

There are many questions, of great pathological interest and importance, surrounding the subject of cerebral hæmorrhage and disorder of the cerebral circulation, that cannot be referred to, even briefly, in a work strictly limited in its object and purpose as this is. We must here confine ourselves closely to those details which bear, more or less directly, on the therapeutic management of the diseased conditions which arise in consequence of the occurrence of the lesions mentioned in the title of this section.

Apoplexy, which is the name for a clinical, rather than a pathological, conception, refers to a sudden loss or suspension of consciousness and power of motion.

These may, however, be suspended, as in certain intoxications, without apoplexy; for, in the latter, this loss is assumed to be *sudden*, as by a "*stroke.*"

And again, although apoplexy and cerebral hæmorrhage have been regarded as convertible terms, strictly speaking they are not so; for a small hæmorrhage, in certain districts of the brain, may cause hemiplegia without loss of consciousness; and even in some cases of large hæmorrhages, slowly poured out (ingravescent apoplexy), there is no "stroke," or *sudden* loss of consciousness, but the so-called apoplectic state develops gradually, and it may be some hours before loss of consciousness and motion is complete, and profound coma is established.

Although the apoplectic state is usually caused by the rupture of a cerebral vessel and hæmorrhage into the substance of the brain, or on its surface, yet it may also arise without the existence of cerebral hæmorrhage; and cases have been observed where hemiplegia and coma, and even *sudden* loss of consciousness, have been caused by obstruction to the cerebral circulation, and the cutting off of the blood supply (anæmia) of a certain portion of the brain, without any vascular rupture. We must, therefore, admit obstructive anæmia and softening from cerebral embolism or thrombosis as also a cause of apoplexy; and there is evidence to prove that syphilitic arteritis may likewise give rise to the same phenomena.

As a rule, we have to rely on collateral circumstances in order to enable us to distinguish which of these causes is in operation. An apoplectic seizure, in a person over forty years of age, may, with very rare exceptions, be assumed to be due to hæmorrhage. In younger persons, if we find a history of cardiac valvular disease, there is a presumption in favour of embolism. But we must not overlook the fact that hæmorrhage may result *indirectly* from embolism, owing to the formation of an aneurism on the obstructed artery. If, on the other hand, we find in these younger patients evidences of constitutional syphilis, we may suspect the apoplectic attack to be due to syphilitic arteritis.

Cerebral hæmorrhage, from arterial rupture, being by far the commonest cause of apoplexy, we must next inquire, what is the cause of this hæmorrhage? Disease of the cerebral vessels, chronic arteritis, usually associated with general arterio-sclerosis, and, in Great Britain, often found associated with chronic renal disease (contracted, granular kidney), is the main cause of cerebral hæmorrhage. These morbid changes in the arteries may originate in chronic alcoholism, in syphilis, or in over-exertion — prolonged muscular strain, as in athletic competitions, and severe and sustained physical labour. Old age also naturally brings these degenerative changes in its train. We believe that in some instances these general arterial changes are determined by hereditary influences, and that the inherited gouty or rheumatic constitution will often be expressed in a disposition to early arterial degeneration. We also believe that malarial and other forms of recurrent pyrexia are apt to lead to degenerative arterial changes. We have already considered these questions in the chapter on arterio-sclerosis.

The much greater frequency with which the occurrence of cerebral hæmorrhage is observed to be associated with chronic gouty kidney in England than on the Continent may probably be accounted for by the far greater prevalence of gout amongst the population of this country. Given the existence of a morbid state of the cerebral vessels, it is easy to see how the hypertrophied heart and heightened vascular tension of chronic renal disease greatly increase the risk of cerebral hæmorrhage from rupture. Charcot and Bouchard have shown that in a great number of cases the hæmorrhage is *directly* due to the rupture of *miliary aneurisms*, which form on the trunk or branches of these diseased vessels.

The following are the most important **symptoms** that accompany and follow an apoplectic seizure. Without any warning, and perhaps while engaged in some action requiring rather more than usual muscular effort, the person attacked with apoplexy falls to the ground, paralysed and unconscious. Sometimes the loss of consciousness may not come on till a few minutes after the paralysis. The loss of consciousness is complete and profound. The face is usually livid or congested; the pupils may be small, dilated, or unequal (the larger being usually on the side of the lesion), and insensible; the respiration slow and stertorous; the pulse may be full, slow, and hard; the temperature may fall below the normal, or, in hæmorrhage at the base, it may be high; the evacuations are passed involuntarily; there may be slight twitchings of the muscles, but convulsions are rare; on examining the limbs, more or less complete paralysis of one side of the body will be discovered, and it will be noticed that the cheeks are greatly puffed out during expiration; the head and eyes are often turned strongly to one side—the patient is said to look towards the lesion! In some cases, the so-called "*ingravescent*" ones, in which we may suppose the hæmorrhage to be slowly poured out, the attack is developed very gradually; and it may be some time before complete loss of consciousness and muscular paralysis are established.

Within the next forty-eight hours, owing to inflammatory changes around the clot, some febrile reaction may occur, and the temperature may rise many degrees, even up to 107° or 108°—a very unfavourable sign; and some *rigidity* may be observed in the paralysed limbs.

When the hæmorrhage has been extensive, and very serious injury has been inflicted on the surrounding structures, the coma may deepen, the febrile reaction may be very great, bed-sores may form rapidly, the presence of albumen and sugar may be detected in the urine, and death may speedily ensue.

On the other hand, a fall of temperature on the third or fourth day and a return of consciousness are favourable signs. The subsequent course of the case depends on the extent and site of the lesion. If the lesion is slight the hemiplegia may disappear altogether in a few days or a few weeks. The facial paralysis is usually the first to disappear, then that of the leg, then that of the shoulder and upper arm, and finally, that of the fore-arm and hand. In chronic cases, where improvement is slow to appear, *contraction* of the muscles of the paralysed limbs, most marked in the upper extremity, comes on within eight or ten weeks. Some pain in the affected limbs usually attends the development of these contractions, which rarely entirely disappear, although they may be somewhat remedied, as we shall see, by suitable treatment.

With regard to a **preventive** treatment of apoplexy, it is scarcely necessary to say that it cannot *openly* be entertained, except in the case of a patient who has already had an attack; for to suggest to a patient that he was in danger of apoplexy would, perhaps, be one of the most certain means of inducing an attack. The mental anxiety and distress which such an announcement would be almost certain to produce would, necessarily, be most prejudicial, and would be calculated to increase, rather than diminish, circulatory excitement. On the other hand, the rational treatment which would be prescribed by any intelligent and practical physician, when consulted by a patient suffering from those degenerative changes, or those constitutional or local diseases which involve the danger of cerebral hæmorrhage, would obviously be devised and directed to protecting him from *all* the morbid tendencies or accidents to which he was exposed. The preventive treatment of apoplexy can, then, only be the rational and appropriate treatment of those morbid conditions which we have mentioned above, and which have been dealt with in other chapters.

The practice of drugging a patient with arsenic, aconite, veratrum viride, digitalis, strophanthus, or strychnine, etc., with the sole view of preventing an attack of apoplexy with which he may be supposed to be threatened, is to be strongly deprecated.

The **treatment** of cerebral hæmorrhage may be considered under the following circumstances:—First, at the onset of the apoplectic attack, and during the stage of unconsciousness; secondly, during the period of febrile reaction; thirdly, on recovery of consciousness immediately after the attack; fourthly, the treatment of the hemiplegia that usually remains, after the attack has been recovered from; fifthly, the measures to be recommended to prevent a recurrence.

1. The first *indication*, of course, in a hæmorrhagic case, is, by reducing arterial tension, to prevent, if possible, the further outpouring of blood from the ruptured cerebral vessel or miliary aneurism. For this purpose the patient should be kept as completely at rest as possible; and all movement or disturbance of the body should be forbidden. When it is practicable, he should not be moved from the place in which he has fallen, or only on to a mattress or bed; the shoulders and neck should be raised, but care should be taken not to put a pillow under the

back of the head, so as to throw the chin down on the chest, as in that position the pharynx becomes obstructed by the tongue, and stertorous (obstructed) breathing is produced. To avoid this stertorous or obstructed breathing, it has been suggested that the patient should be turned on to the side opposite to the seat of the lesion, and sometimes it may be needful to draw the tongue out of the way by forceps; but we consider even this amount of movement should, if possible, be avoided; and we have observed the noisy dyspnœa disappear on the removal of the pillow, which is generally placed at the back of the head, and which throws the chin down on to the chest. All pressure round the neck and all tight clothes must be removed; and it is often necessary, in order to avoid disturbance of the patient, to cut them away. When the coma is very profound, and the paralysis general, the case must be regarded as hopeless; and the exhibition of any excessive zeal or meddlesomeness should be avoided, especially when the patient is advanced in years, as will most frequently be the case. If, however, the case has not this altogether hopeless aspect, and the patient is not very advanced in years, the question of more active interference must be considered. Shall we, or shall we not, bleed the patient? In the case of an old and feeble person, we may at once decide not to do so; and in younger persons, if there should be any grounds for believing that the apoplectic attack may be caused by cerebral anæmia and softening from embolism, or thrombosis, we should also put aside the idea of the removal of blood as only likely to do harm. If, again, there are signs of cardiac debility, and a pulse of low tension, we should not think of bleeding.

If, however, in a still vigorous man, we find a full, hard pulse of high tension, an hypertrophied left ventricle, a flushed face, pulsating carotids, and an accentuated aortic second sound, then it can hardly be wrong to open a vein in the arm and let out a full stream of blood, so as to rapidly reduce the arterial tension, and so favour the cessation of the hæmorrhage into the brain, by promoting the formation of a coagulum at the bleeding point. The older physicians tell us that patients, when bled, used to emerge from their apoplectic coma as the blood was flowing; and there seems no good reason for doubting this, as we may suppose they frequently had to deal with such cases as we have just described.

Fagge, who is, on the whole, averse from bleeding, points out, however, that, in cases "in which the symptoms of cerebral hæmorrhage are slowly ingravescent," not only should the patient be kept absolutely still, and the administration of brandy, and even ammonia, strictly forbidden, the limbs being kept warm by friction with hot flannels, but "as reaction comes on, the question of blood-letting must be most seriously weighed . . . it is possible that free venesection, just at the time when the vigour of the circulation is being re-established, may, by lowering the pressure in the cerebral vessels, prevent further effusion of blood." *

There is, however, another method of lowering arterial tension, and of relieving cerebral hyperæmia, which is almost universally adopted, and that is the administration of a strong purgative. Five to 10 grains of calomel are thrown on the tongue, or a drop or two of croton oil, mixed with 4 or 5 drops of glycerine or olive oil, may be dropped into the mouth. But this even we should not do in old, debilitated persons, with a weak heart and a feeble pulse. If the bowels are loaded, in such cases it is best to clear them out by means of an enema of olive oil and turpentine, mixed with warm soap and water. An ice-bag should be applied to the head on the side of the lesion, and hot-water bottles to the feet. The hot bottles must be well protected, owing to the tendency, in these cases, to the formation of blisters and sloughs. The inclination on the part of anxious friends to feed

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* "Principles and Practice of Medicine," vol. i., p. 595.

the patient by the mouth, when he is really unable to swallow, must be restrained; and they should be informed of the danger of the passage of food and drink into the air passages; and that no harm can arise from abstention from food for a day or two. There is no objection to rectal feeding, if the general condition of the patient points to the need of nourishment or stimulant. If the mouth is dry it may be moistened with a feather dipped in glycerine and water, having some mild antiseptic (boric acid) in solution.

The evacuation of the bladder must be seen to, and the catheter used regularly so long as the patient remains comatose; and the bed should be examined, to see that it is smooth and even, and that there is no undue pressure or friction of the skin of the back, as bed sores are very readily established in these cases. The patient's bedroom must be kept quiet and darkened.

2. During the period of febrile reaction it is important to prevent, if we can, the spread of inflammatory reaction in the brain substance, and to hasten the absorption of the clot. Osler thinks "aconite may be indicated" at this period; but highly as we regard the anti-febrile properties of this drug in the inflammatory affections of childhood and youth, we have rarely seen it act favourably in the aged. The best course to follow is to keep up the application of ice to the head, and to purge freely, and to avoid giving stimulants.

We do not see any likelihood of ordinary hæmostatics, such as acetate of lead, gallic acid, or ergot, being of use in arresting cerebral hæmorrhage, more especially as the patient is usually unable to swallow; and it is difficult to know whether the hypodermic injection of ergotin would do harm or good; so far as it tends to raise arterial tension by causing contraction of the arterioles generally, it would seem likely to do harm; whereas, on the other hand, by causing contraction of the bleeding vessel, or the trunk from which it proceeds, it might favour the arrest of the hæmorrhage; it must, however, be borne in mind that it cannot act on the walls of diseased arteries as it does on healthy ones. It might, however, be worth trying in ingravescent cases, as they are generally fatal as at present managed.

When the apoplectic attack is due to softening from embolism or thrombosis, there is little to be done by treatment beyond keeping the patient absolutely still and quiet. Bleeding is counter-indicated, as it lowers tension, favours coagulation, and tends, therefore, still further to depress the nutrition of the brain substances. Free purgation is also to be avoided, and a gentle aperient action only should be sought for. Should there be irregularity and feebleness of the heart's action, stimulants, such as ether and ammonia, may be given, and some recommend small doses of digitalis.

In thrombosis from syphilitic arteritis (which is met with usually in males between 20 and 40 years of age, and which may cause hemiplegia without loss of consciousness), anti-syphilitic medication must be vigorously applied; 20 to 30 grains of potassium iodide must be given three times a day, and mercurial inunctions freely used.

Embolic cases associated with cardio-vascular disease are not always attended by apoplexy. *Hemiplegia* may occur without loss of consciousness, and in such cases the patient should for a time be confined to bed and kept on a simple but nutritious diet, and if the area of softening is limited and its situation comparatively unimportant, complete or partial recovery may be established.

3. On the recovery of consciousness after an apoplectic seizure, the patient requires the greatest possible care and cautious management, in order to avoid a recurrence of hæmorrhage and to favour the subsidence of the cerebral inflammation and irritation excited around the clot. The diet must be very light and unstimulating, and consist of milk and

farinaceous foods chiefly. Cold applications to the head must still be maintained, free action of the bowels must be kept up, and benefit is sometimes obtained from the derivative action of mustard plasters or blisters to the nape of the neck. Some give small doses of aconite with potassium bromide at this time, and later on the bromide combined with iodide, with the view of promoting the absorption of the extravasated blood.

4. The treatment of the **hemiplegia** and the rigidity and contraction of the muscles which follow the apoplectic attack is of some importance, our object being to guard against late rigidity, articular adhesion, and muscular atrophy. Early systematic treatment may effect much in these directions.

Articular adhesions, which are perhaps the most serious of the troubles to be prevented, may be obviated by the early application of gentle passive movements, several times a day, to the joints involved.

The spasticity or early rigidity of muscles must also not be neglected, lest it pass into late or permanent rigidity. We should therefore early seek to correct all faulty and abnormal positions the limbs may tend to assume. A sand-bag in the axilla will prevent adduction of the shoulder. The elbow should be kept extended rather than flexed. The same principle should be applied to the lower limbs. The contraction of muscles may be counteracted by efforts to improve the nutrition of their weaker antagonists. The use of sand-bags will be of value to maintain favourable positions for the limbs, and the interest of the patient himself may be aroused in assisting, by means of the sound limbs, in righting these deforming tendencies.

Muscular atrophy will be remedied by passive movements, gentle massage, and electricity. We should massage only the weaker muscles, and the massage should be skilfully directed by the medical attendant, if not actually applied by him. Faradaism and galvanism are useful adjuncts to massage, but they cannot take its place. Strong currents must not be used. They should not be so strong as to cause pain or muscular contraction. In favourable cases we should attempt to re-educate and amplify the muscular movements. This will require a good deal of patient endeavour on the part both of the doctor and of the patient.

As improvement proceeds, *exercises* and *mechano-therapeutics* may be employed to increase power already to some extent regained. Such measures may also be of value in remedying inco-ordination and weakness of the limbs.*

The diet during convalescence must be light and nutritious, but not exciting. It is best to avoid animal food, or at any rate to limit it to a little chicken or fish. No alcoholic drinks, save for exceptional reasons, should be permitted, and strong tea and coffee are best avoided. But the digestive peculiarities of each patient must be studied, and no attempt made to carry out a hard-and-fast rule as to diet. A strictly vegetarian diet, with milk, has been advocated, and this, where it agrees well, is sound advice; but where, from individual peculiarities, this is not the case, it is worse than useless to insist on such a strict *régime*. General tonic treatment may be needed, as in convalescence from other illnesses, but in those cases it should be attempted with great caution and care, lest any cerebral irritation be re-excited. The bowels must be specially attended to, and regular daily evacuations secured. All brain work must of course be forbidden, and everything that can excite the emotions or irritate the temper—and such patients are apt to display periods of irritability—must be kept at a distance. If the patient is restless at night and sleepless, it may be necessary to give some bromide at bed-time, with which a little henbane may, if necessary, be combined.

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* A very full and instructive paper on the treatment of hemiplegia, by Dr. Guthrie, will be found in the *Lancet*, vol. ii., 1901, p. 1035.

When the hemiplegia has become chronic, and specially when contractions have developed, there is perhaps little use in submitting the patient to any further electrical or other treatment. But many well-to-do patients do not readily reconcile themselves to this "masterly inactivity," and it is in such instances that a course of baths, combined with electrical treatment and massage, at such thermal stations as Gastein, Ragatz, Wildbad, or Teplitz, may be occasionally recommended. Such courses cannot cure or remedy what is incurable and irremediable, but they induce an effort to lead an out-of-door life and to be much in the health-restoring open air of those pleasant resorts, and it has been often observed that both cerebral and spinal paralyses do improve in such places, after treatment therein. Niemeyer suggests that some of this improvement may possibly be due to a favourable influence exerted by the baths on the inflammation around the clot and on that part of the paralysis due to it.

5. Finally, we have to consider what are the best rules to enforce on such persons as have had an apoplectic seizure, or are known to be predisposed to one, in order to **prevent** an attack or a recurrence. We have elsewhere pointed out the kind of diet best suited to such patients—white meats, green vegetables, and ripe fruits, and the avoidance of butcher's meat, fats, and saccharine substances—and, above all, *great moderation* in eating and drinking should be enforced. As the bowels are likely to be sluggish, a daily laxative is advisable, as all straining at stool is particularly to be avoided. All kinds of emotional excitement, and especially attempts at sexual intercourse, must be strictly forbidden. Gentle and regular exercise in the open air, stopping short of fatigue, is advantageous. The functions of the skin should be promoted by warm baths and frictions. If the patient should be gouty, a mild course of alkaline saline mineral waters may occasionally be useful, but these may be taken at home, and need

not involve the trouble of a visit to a Continental spa.

In short, free elimination by all the excreting organs should be promoted. Co-existing renal, cardiac, or arterial disease must be treated on the general principles already laid down in former chapters. The object of preventive treatment is, it should be remembered, to diminish the tendency to high arterial blood pressure, and to avoid putting any strain on degenerated blood-vessels.

Certain surgical measures have been advocated in the treatment of cerebral hæmorrhage, but they can hardly be said to have been found of value clinically. We are living in an age especially characterised by surgical interference and activity—an age which will probably be known in the future history of medical science as "the surgical age." It is not then surprising that somewhat bold proposals should have emanated from enterprising surgical minds in connection with the treatment of apoplexy. We refer especially to ligaturing or compressing the carotids for the purpose of arresting cerebral hæmorrhage, and to trephining the skull for the removal of a blood clot, or a hæmorrhagic effusion in the substance of the brain, or in the ventricles. Until the value of such measures has been practically demonstrated by distinctly improved clinical results we shall refrain from advising their adoption!

CEREBRAL TUMOUR.

Although tumours of the brain do not afford a very promising field for successful therapeutic effort, yet there are many interesting points in connection with the treatment and management of these cases which merit a brief consideration at our hands.

The space at our disposal, as well as the restricted scope and object of this work, forbid our entering upon anything but the briefest notice of the clinical features of these cases, which often need the most elaborate investigations in the attempt at localisation of lesions; an attempt which, from the intrinsic difficulty of the subject, frequently fails, even when undertaken by the most experienced neurologists.

The brain seems to be a favourite seat for the development of neoplasms. The most common forms are glioma, tubercle, sarcoma, and syphilitic gumma. Carcinoma is much rarer. Many other forms, including parasitic and other cysts (hydatid, cysticercus, etc.) occur, but with much less frequency, and offer few special points of interest in connection with treatment.

In children, *tubercle* would appear to be the most frequent form of cerebral tumour; in adults, *glioma*, *syphiloma*, and *sarcoma*. The *most frequent* seat of tumour is the medullary substance of the cerebrum, and next in frequency is the cerebellum, then the pons and the central ganglia, then the corpora quadrigemina. *Glioma* is rarely found anywhere but in the cerebral hemispheres and in the cerebellum. Solitary *tubercle* occurs most frequently in the pons, the cerebellum, and the cerebral cortex. *Sarcomata* grow particularly from the periphery into the cranial cavity, often commencing in the bones at the base of the skull. As to the rate of growth, glioma grows slowly, and so do most of the hard sarcomata; carcinoma grows rapidly; tubercle may enlarge rapidly, but it may also remain stationary for a long time, and occasionally cease to grow and become calcified. Syphilomata are characterised by sudden rapid advances, and also by rapid retrogressive changes!

Glioma and sarcoma generally occur singly, and the former is usually primary, but the latter is sometimes secondary and metastatic. Carcinoma is probably always metastatic and generally multiple. Tubercle and syphiloma are also generally multiple.

There is little to be said with regard to the *etiology* of these growths. Tubercular and syphilitic tumours are generally secondary to similar manifestations in other parts of the body. Secondary intracranial tumours often follow primary deposit in the lungs. Parasitic cysts (hydatid, cysticercus) are generally found also elsewhere in the body. Syphiloma is rarely found in young subjects as a result of inherited syphilis.

Some appear to originate in traumatism or to develop from cicatrices.

The *symptoms* of cerebral tumours are, for the most part, referrible to *intracranial pressure*; they are divided into (*a*) *general* cerebral symptoms, and (*b*) *focal* symptoms—*i.e.* those dependent on the seat of the lesions. Our chief concern is with the former; these are mainly—(1) *double optic neuritis,* or "choked disc"; (2) *headache,* pain in the head; and (3) *vomiting.* These are the three chief symptoms. To these may be added stupor (as the disease advances), vertigo, retardation of the pulse, and generalised, and in some instances localised, convulsions.

Oppenheim considers optic neuritis and choked disc to be the *most pathognomonic* of these manifestations.

Headache is almost constantly present, and it is often *very intense,* and tends to undergo exacerbation even from the slightest jar or movement. It is generally diffuse, but sometimes limited to the occipital or frontal region. Stupor, rarely absent in advanced cases, may become profound. *Vomiting* is present in most cases; it generally comes on subsequently to the headache, and has no definite relation to meals. *Vertigo* is especially observed in cases of cerebellar tumours. Attacks of unconsciousness with convulsions are frequent. Attacks of Jacksonian epilepsy may also occur. As in all cases of increased intracranial pressure, permanent or temporary slowing of the pulse has been noted in a large number of cases.

What may be regarded as "focal" symptoms are too varied and too numerous for consideration in this work, but they must be most carefully investigated in all cases before operative procedures can be recommended.

Oppenheim observes in regard to the general symptoms: "Every persistent and severe headache should awaken a suspicion of brain tumour," and "a papillitis or optic neuritis almost confirms a diagnosis of cerebral tumour,"* after, of course, eliminating renal and other disease. As to the *course* of cerebral tumour, it usually lasts some years, it is often latent, and then enters upon a stormy period, ending in death.

The prognosis is grave in all but syphilitic cases. We have already said that tuberculous growths sometimes cease to increase in size and become calcified.

With regard to the **treatment** of cases of **cerebral tumour,** our first object must be to promote absorption of the growth through the influence of remedial agents administered internally. This is rarely possible, except in syphilitic cases, and wherever there is the *slightest suspicion* of syphilis, anti-syphilitic treatment is demanded, and indeed prolonged treatment with large doses of potassium iodide has been found of great service even in non-syphilitic cases, a pronounced improvement and remission of symptoms having been observed. Anti-syphilitic measures must be applied with energy and patience.

The iodides of sodium or potassium must be given for long periods in large doses; beginning with 30 grains of potassium iodide 3 times a day, we must, if necessary, give these doses 4 or 5 times a day. Such large doses given continuously have again and again been found to succeed after smaller ones have failed. Mercury also must, if necessary, be administered at the same time; best, perhaps, by the method of inunction.

From ½ a dram to a dram of mercurial ointment should be rubbed, twice a day, into the skin of the abdomen, the inside of the thighs, the flanks, or the axillary regions. It is a good plan to give the patient a warm bath before the inunction to promote the capillary circulation of the skin. If improvement of the symptoms sets in, the inunctions may be given on alternate days instead of daily, and after several weeks the dose may be diminished by one half. In this way the treatment must be patiently persevered with until all the symptoms have disappeared, and it must be resumed upon any indication of their return.

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* "Diseases of the Nervous System" (Mayer's translation), p. 576.

It is advisable to keep the mouth and teeth scrupulously clean during this treatment in order to avoid salivation, which might necessitate the suspension of the treatment. Hypodermic injections of mercuric perchloride have been used in these cases with excellent results; 12 to 20 minims of a 1 per cent. solution have been injected deeply into the subcutaneous connective tissue in the back and flanks, 25 to 30 such injections being given on successive days, the dose being gradually increased until slight salivation sets in, and then gradually diminished. Small doses of potassium iodide were subsequently given for three months or longer.

During this treatment the patient should be kept quiet and at rest, and given a light, nourishing diet. The bowels should be regulated, if necessary, by gentle aperients.

Under treatment of this kind remarkable recoveries have often been witnessed. In tuberculous cases the iodides have also been tried, but in smaller doses, 5 to 7 grains thrice daily. Iodoform in pills might also be given internally, and a mixture of iodoform ointment and cod-liver oil (equal parts), rubbed into the scalp and also into the skin of the abdomen daily. This treatment, to be effectual, like the anti-syphilitic treatment, must be patiently and energetically persevered in.

Before we consider the merely palliative but highly necessary remedies for the relief of the distressing symptoms, it will be well to refer to the important question of the applicability of *surgical* measures for the removal of the tumour.

Far more hopeful views were entertained a few years ago as to the future of cerebral surgery than are now accepted. Oppenheim says, "The enthusiasm for operative treatment of cerebral cases has decreased considerably. The cases that can be cured are few, and these are exactly those in which the subjective symptoms are so slight that it is difficult to induce the patient to consent to an operation." He points out also that the dangers of the operation are great, and that after operation the tumour has often not been found. Byrom Bramwell also testifies that in his experience "the cases in which an intracranial tumour can be completely and successfully removed by the surgeon are, relatively speaking, very rare."* Oppenheim † concludes that not more than 6 per cent. of these cases are suitable for operation, and that in these the risk to life is great. The following indications for operation have been thus formulated by Bergmann and others: 1st, we should be able to locate the tumour by the symptoms; 2nd, it should be in or near the cortex on the outer convex surface of the hemispheres; 3rd, it should be circumscribed and enucleable, not diffused into the surrounding brain substance; 4th, the probability should point to its being single, not multiple; 5th, it should not be malignant or metastatic; 6th, it should not be too large.

Another surgical measure which has been proposed as a palliative and for the purpose of lessening the intracranial pressure by the removal of some of the cerebro-spinal fluid, is *trephining* the cranium and opening the dura mater. It is stated that this operation has been attended by relief of the intense headache and exhausting vomiting, and by removal or diminution of the optic neuritis, and that life has certainly been prolonged by it. But even this operation is not unattended with serious risks, and Oppenheim maintains that it should only be undertaken when the symptoms are very severe and fail to be relieved by other measures, or when ocular disturbance progresses rapidly and blindness is imminent. Byrom Bramwell also points out* that this operation entails danger to life, and in other cases risk of inducing paralysis; at the same time he concludes that the advantages to be gained by this operation are greater than its disadvantages.

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* Allbutt's "System of Medicine," vol. vii., p. 663.

† *Op. cit.*, p. 581.

Another palliative surgical measure which has been advocated and applied for the relief of extreme intracranial pressure is *lumbar puncture.* It has produced temporary improvement in some cases, but Oppenheim has noticed "a longer amelioration in only one case," and he does not consider the results, "on the whole, very promising." In some cases the symptoms, especially the headache, increased after the puncture, and, in some, fresh paralytic symptoms almost immediately followed it. The operation has also brought on spinal and girdle pains in some cases, and in others it has proved fatal.

A calm and unprejudiced review of the results of surgical interference in the treatment of cerebral tumours is not encouraging, and shows that the cases in which it is safely applicable are extremely few.

In conclusion, we have only now to consider what other palliative resources are at our command to relieve the distressing symptoms of these painful cases.

Leeches, the ice-bag, hot foot-baths, purgatives, have all, in their turn, been found at times useful in relieving the severe headache. The occipital headache has sometimes been benefited by the applications of the Paquelin cautery.

Epileptiform convulsions and spasms may be relieved by the use of the bromides combined with chloral. We have already insisted on the value of potassium iodide, even in the non-syphilitic cases. Many physicians think highly of the combination of cannabis indica with the bromides or with butyl chloral. Antipyrin and phenacetin have also been found serviceable for the relief of the headache. But when these measures fail, as it is only too likely they will, in many cases, our only resource, and it is one we must not hesitate to use, is the hypodermic injection of morphine. We may wisely postpone its employment as long as possible, but we shall have, in the end, to have recourse to it in order to alleviate the terrible sufferings which the patient would otherwise have to endure.

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* *Op. cit.*

ADDITIONAL FORMULÆ.

Aperient powders in meningitis.

℞ Hydrargyri subchloridi, gr. vjss ad xij.
Pulveris radicis jalapæ, gr. xv ad xx.
Sacchari albi, gr. lxxv.
M. et div. in pulv. vj. A powder every hour.
(*Bamberger.*)

For violent headache in meningitis unrelieved by local bleeding or application of ice.

℞ Morphinæ hydrochloridi, gr. ¾.
Sacchari albi, gr. lxxv.
M. et div. in pulv. v. One every three hours until a sedative effect is produced.
(*Bamberger.*)

Mixture in meningitis.

℞ Potassii iodidi, gr. xv ad xxx.
Aquæ menthæ piperitæ, ʒv.
Aquæ destillatæ ad ℥iij.
M. f. mist. A dessertspoonful three or four times a day.
(*Henoch.*)

For great depression in meningitis.

℞ Camphoræ, gr. vijss.
Emulsionis amygdalæ, ℥j.
M. Half to be given by the rectum. (*Bamberger.*)

For convulsions in tubercular meningitis.

℞ Chloral hydrate, gr. vijss ad xv.
Decocti althææ, ℥iij.
M. Half to be given by the rectum. (*Widerhofer.*)

For apoplexy after all active symptoms have ceased.

℞ Hydrargyri perchloridi, gr. j.
Sodii chloridi, gr. xx.
Glycerini, ℥j.
Aquæ destillatæ ad ℥viij.
M. f. mist. A dessertspoonful, gradually increased to a tablespoonful, thrice a day immediately after meals.
(*Engel.*)

Hæmostatic in cerebral hæmorrhage.

℞ Extracti ergoti fluidi, ʒj.
Glycerini, ♏xxx.
Aquæ ad ℥j.
M. f. haustus. Every three hours. (*Bruce.*)

In paralytic stage after cerebral hæmorrhage.

℞ Liquoris strychninæ hydrochloridi, ♏iii.
Tincturæ aurantii, ʒss.
Aquæ chloroformi ad ℥j.
M. f. haust. Three times a day after meals. (*Bruce.*)

CHAPTER II.

THE TREATMENT OF DISEASES OF THE SPINAL CORD.

Tabes, or Locomotor Ataxy (*Sclerosis of Posterior Columns*).—Characters, Symptoms, and Course—Causation—Relation to Syphilis—Indications for *Treatment*—Anti-Syphilitic Remedies—Arsenic—Nitrate of Silver—Corrosive Sublimate—Gold Salts—Ergot—*Treatment* of the *Lightning Pains* and *Gastric Crises*—Value of Counter-irritation—Ice-bag—Value of Electricity—Suspension—Re-education Movements—Hydrotherapy—Baths and Massage—Climate, Food, etc.

Infantile Paralysis (*Acute Atrophic Spinal Paralysis—Anterior Poliomyelitis*).—Nature, Course, and Symptoms—*Indications for Treatment* in the Acute Stage—Counter-irritation—Antipyretics—Spinal Ice-bag—Ergot—Potassium iodide and Mercury—Sedatives—Treatment in Later Stage—Strychnine—Mechanical Exercises—Massage—Electricity—Orthopædic Appliances.

Paraplegia and the Morbid Conditions associated therewith.—Its Causes—*Myelitis*, etc. etc.—Symptoms in *Acute Myelitis*—In *Chronic Interstitial Myelitis*—In *Compression* Cases—In *Spastic Paraplegia*—Indications for *Treatment*, which is usually palliative rather than curative—Counter-irritation—Ice-bag—Value of Aperients—Attention to Vesical and Rectal Troubles, and to the Prevention of Bed Sores—Ergot—Potassium Iodide—Electricity—Thermal Baths—Hydrotherapy—Strychnine—Treatment of *Compression* Cases—Rest and Suspension—Antituberculous Treatment—Surgical Treatment—Treatment of Spastic Paraplegia.

Progressive Muscular Atrophy, etc. Additional Formulæ.

It has been said that the treatment of "diseases of the spinal cord is one of the darkest chapters in therapeutics," and it certainly is remarkable that while there has been so great an amount of light thrown on the nature and classification of these diseases by modern pathological investigations, yet, so far as their therapeutics is concerned, the result has rather been to demonstrate how useless and futile it is to attempt to discover any causal indications for their treatment. Apart from syphilis, which is so often invoked as affording such an indication, the treatment of these lesions is almost wholly limited to alleviating, or diminishing, or limiting the intensity of their effects; the lesions themselves being regarded as beyond the reach of curative agents.

TABES DORSALIS, OR LOCOMOTOR ATAXIA.

(*Posterior Sclerosis.*)

This readily recognisable disease, named by Duchenne *progressive* locomotor ataxy, from its tendency to a steadily progressive advance, has also been termed "*posterior sclerosis*," because its main anatomical feature consists in degenerative changes in the posterior spinal nerve roots, and the parts of the posterior columns continuous with them. It is what, in modern terms, is called a "system" disease, the system of fibres involved being those that enter the cord by the posterior nerve roots. It is chiefly characterised by a curious disorder of muscular movements, affecting usually, in the first place, the muscles of the lower extremities, and, in some cases, extending, sooner or later, to those of the upper limbs. The muscles lose, to a greater or less extent, their power of co-ordinate action; they are not paralysed—they can lift weights, and can voluntarily offer a considerable amount of resistance to extension or flexion; but they lose, in a progressive manner, the power of harmonious co-operation for definite ends.

The peculiar gait of the ataxic patient is well known: the feet thrown outwards and upwards as he walks, and then brought down on the ground with an exaggerated stamp; and his inability to walk along a straight line, or with his eyes closed, or to turn sharp round, without staggering. Disturbances of sensation are also common, such as numbness, creeping, and a curious retardation in the transmission of sensory impressions, especially of pain. Irritability or paresis of the bladder, and gradual impairment and ultimate loss of sexual power, generally accompany these other symptoms. Loss of knee-jerk is one of the earliest symptoms.

A symptom, which may long precede the other manifestations of this disease, or may accompany them, is the occurrence of the so-called "*lightning pains*"—pains of exceedingly brief duration and frequent recurrence, suddenly shooting through the limbs and other parts of the body. They vary greatly in intensity in different patients; sometimes they are most agonising, and their occurrence is a perfect terror to the sufferer. They are apt to occur at night. They may be induced by over-exertion, mental or physical; and some have observed that they are prone to occur during cold, wet, and windy weather. Pains in the back or limbs of a more continuous aching, boring character are also often complained of.

There is another painful symptom apt to occur in this disease, and termed by French physicians "*crises gastriques.*" These consist in very severe attacks of gastric pain, attended usually with vomiting of very acid fluid. Other "*crises*" may also occur, as laryngeal and pharyngeal "*crises.*" Pains in the bladder and rectum are not uncommon. The paresis of the bladder may lead to cystitis; and there is generally obstinate constipation, with distressing flatulence.

Various *ocular* symptoms have been noted; some dependent on paresis of the ocular muscles, such as strabismus, ptosis, diplopia, contracted pupils; and others on optic atrophy. This last may go on to complete blindness; and when this is the case there is rarely any ataxia; such cases have been termed tabes without ataxia! An early symptom which is looked upon as of some diagnostic importance is that known as "the Argyll-Robertson pupil" or *reflex iridoplegia*; the pupil does not contract to light, but does so during efforts at convergence and accommodation. Charcot's joint-disease, and perforating ulcer of the foot, are amongst the rarer complications of this disease.

Though rarely or never cured, it is a disease that runs a very irregular course. The pre ataxic state, distinguished by lightning pains, loss of knee-jerk (in certain rare cases the knee-jerk is preserved, *i.e.* where the disease begins at a higher level—*cervical tabes*), and reflex iridoplegia, may last an indefinite period; and in some instances, as we have already said, ataxia never occurs. The ataxic symptoms may advance slowly, and sometimes remain stationary for many years, or appear to be arrested. Sometimes exacerbations occur, and the disease will advance with great rapidity.

Some so-called "acute" cases run a rapid course from the first. The disease rarely itself causes death; in advanced stages, when the patient becomes bedridden, he is apt to succumb to some intercurrent malady.

The next point that chiefly concerns us here is the **causation** of this disease; what is the cause of this *posterior sclerosis*, or *grey induration* of the posterior columns of the cord, which is the chief anatomical lesion in tabes? It has been found to be of far more frequent occurrence in males than in females—the estimate of some authorities being as great as 10 to 1. It rarely occurs before twenty, or begins after fifty. The tendency to regard **syphilis** as the chief or only causal agent in this malady is almost universal amongst competent authorities. Erb found that of 300 cases of tabes in private practice, 89 per cent. had had syphilis; and Ross, out of 20 cases, was able in one only to exclude syphilis as an antecedent.

It is suggested that syphilis, like other acute infectious diseases, develops in the body a *toxin* having a special affinity for nerve tissues or possibly for a certain system of nerve fibres, so that the afferent nerve system of the cord breaks down, and sometimes other nerve structures as well.

Other contributory causes are exposure to chill, as sleeping on damp ground; over-exertion and fatigue, as in long military marches; venereal excesses; traumatisms and hereditary influences.

We must be content with the foregoing brief reference to the nature and causation of this interesting disease, as an introduction to a consideration of its **treatment.** The *indications* are to arrest, if possible, the progress of the disease; and to relieve the painful and distressing symptoms. In estimating the value of any mode of treatment in this disease we must bear in mind its natural tendency to slowness of progress, to quite long stationary periods, and to the frequent spontaneous remission, or even disappearance, of certain symptoms.

The propriety of submitting the patient to vigorous *anti-syphilitic* treatment is the first question to be considered, as this alone, in the majority of cases, responds to the causal indication. In the majority of cases it will, of course, fail, because, even when due to syphilis, most cases come under treatment too late to effect a cure, although the progress of the disease may be retarded. In the later stages of the disease they do no good, but probably harm. This line of treatment is also counter-indicated in the class of cases in which optic-nerve atrophy is the initial symptom, as mercury has been found to hasten and not retard this process.

Anti-syphilitic treatment, however, affords a chance which should never be overlooked in treating a case of early or threatening tabes, and the earlier we have the opportunity of applying it the better are the results we may expect. Potassium iodide often proves a valuable remedy, even in cases where there is no discoverable syphilitic taint. It seems to exert a remedial effect on the lightning pains. Osler thinks that it is only when the syphilis has been of recent date—when the symptoms develop within two years of the primary affection—that there is a possibility of arrest by mercury and potassium iodide.

Oppenheim states that "personally" he has never seen any good results from anti-syphilitic remedies, but he considers mercury should be used when "there is a positive history of syphilis, or in which we find syphilitic symptoms," or when former anti-syphilitic treatment was incomplete, or when the possibility of syphilis of the spinal cord cannot be excluded.*

The anti-syphilitic treatment should be carried out in the following manner:—About $\frac{1}{2}$ a drachm of mercurial ointment, mixed with an equal part of lanoline, should be rubbed in daily into the inside of the thighs, or in the axillary regions, or over the abdomen; the part of the surface selected having been previously washed with warm water and soap, and then with alcohol. About half an hour should be devoted to the inunctions, and a flannel bandage should be firmly applied afterwards to promote the complete absorption of the drug. The effect is promoted by a warm bath (87° to 90°) for fifteen minutes daily before the inunction. Salivation must be avoided. When there are difficulties in carrying out this plan, the advantage of which is that it does not disturb the digestive functions, mercury must be given internally. The perchloride, in doses of $\frac{1}{48}$ to $\frac{1}{32}$ grain, or the red iodide, in doses of $\frac{1}{12}$ to $\frac{1}{6}$ grain in a pill, may be given thrice daily. At the same time, potassium iodide should be given in gradually increasing doses, from 10 to 60 grains three times a day, in 2 ounces of some bitter infusion an hour before meals. The larger doses should not be continued for more than three or four weeks at a time, but smaller doses may be given for two or three months longer.

When this mode of treatment, or any modification of it, is followed by decided improvement, it is advisable to return to the mercurial inunctions for two or three weeks at a time, at intervals of three or four months.

Apart from anti-syphilitic treatment, the drugs that have received the greatest amount of commendation are arsenic, nitrate of silver, and corrosive sublimate. The first, as one of the best nerve tonics, may possibly retard the disintegration of nerve-fibres in the sclerotic areas of the cord; $\frac{1}{40}$ grain of arsenious acid should be given three times a day. Corrosive sublimate is believed to retard the progress of connective-tissue inflammations; $\frac{1}{50}$ grain may be given thrice daily. These two drugs may be used alternately.

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* "Diseases of Nervous System," p. 140.

The use of *nitrate of silver* is widely advocated as having produced great improvement in many cases. It is given in doses of $\frac{1}{4}$ grain three times a day. It is best administered made into a pill with unguentum kaolin. It has been found to allay the attacks of pain and lessen the liability to them. A great drawback to the employment of this drug is that not only does it tend, after long use, to produce a blue discoloration of the skin, but it is also very apt to cause gastric disturbance. To avoid the latter, it has been suggested that larger doses of *oxide* of silver answer as well and do not produce this effect. Any appearance of discoloration of the skin should lead to the discontinuance of the drug.

Ortho-phosphate of silver has also been given in increasing doses with good effect; it is said not to discolour the skin.

As a substitute for nitrate of silver, over which it certainly possesses the advantage of causing no staining of the skin, the double *chloride of gold and sodium* has been used and praised by many writers. Its use is said to cause absorption or atrophy of morbid connective-tissue formations. It is given in doses of $\frac{1}{30}$ to $\frac{1}{12}$ grain in pills three times a day. Charcot advocated the administration of *ergot* or *ergotine*, not continuously, but for four days in every week. Its use has been attended in early cases with temporary improvement. Church thinks it has a beneficial effect on the bladder symptoms.*

The **lightning pains** and the **gastric crises** require special treatment.

Antipyrin, phenacetin, and exalgin are good remedies with which to combat the lightning pains. They should be given in the ordinary doses, and it is a good plan, as pointed out by Professor Starr, to give these drugs in alternation, each a week at a time, so as not to require to increase the dose. Cannabis indica has been found useful in relieving these pains. When they are associated with increased arterial tension, Osler strongly advises the prolonged use of nitro-glycerine in increasing doses. He has found it of great service in allaying the pains and diminishing the frequency of the crises. Starr has found sodium salicylate, in 10- to 20-grain doses, sometimes relieve the pains when other drugs have failed. This drug, and also colchicum, together with potassium iodide or ammonium chloride, are commended by R. Russell.* A mixture of belladonna and chloroform liniment rubbed in along the spine is sometimes a useful expedient. But when all other drugs fail in relieving these pains, but not until then, we shall be compelled to have recourse to hypodermic injections of morphine; but there is great danger lest the ataxic patient should become a victim of the morphine habit. Other measures have been suggested for the relief of these pains, to which we shall refer immediately, when we have finished with the consideration of the drug treatment of this disease.

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* "Nervous and Mental Diseases," p. 420.

We have only to notice the medicines suitable for the relief of the **gastric crises.** As dyspeptic states often co-exist, it will be often necessary to prescribe bismuth with alkalies and hydrocyanic acid. Small doses of extract of opium or of Battley's solution, taken when the stomach is empty, twice or three times a day, will be useful. Cerium oxalate will sometimes relieve the vomiting. Mustard plasters to the epigastrium, and if necessary morphine hypodermically, will also have to be used. Great care should be taken that the bowels are completely relieved each day, either by some simple aperient, such as the confection of senna, one or two cascara tabloids, or the compound *liquorice* powder; if these fail an enema of tepid water or salt and water may be employed.

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* Allbutt's "System of Medicine," vol. vii., p. 130.

Bladder symptoms also require attention, and when there is a tendency to incomplete evacuation of the urine the patient should be instructed to use a catheter, and how to keep it sterilised.

We now turn to the various methods of treatment that have been suggested for the relief of this affection other than the use of drugs.

Active *counter-irritation* has been advocated, in order to relieve irritation and congestion of the spinal cord, and either blisters, or stimulating liniments, or Paquelin's thermo-cautery or dry-cupping, or the faradic brush, may be used for the purpose. These measures may also be applied to painful parts, and, combined with complete rest in bed, have been found useful in relieving the lightning pains. An ice-bag to the spine for a short period has also been found beneficial.

Blisters on the back are undesirable, on account of the tendency to bed-sores in spinal diseases; and it should be remembered that the cutaneous sensibility in these patients is often greatly impaired, so that the effects of hot applications have to be carefully watched.

The value of **electricity** in the treatment of tabes is very differently estimated by different authorities. Osler thinks it of very little benefit. Erb considers the application of the continuous current to the spine is attended with more or less improvement in the majority of cases. The applications are made once daily for three to six minutes, and he uses only a moderate number of cells. Professor Starr agrees with Gowers and Möbius "that as a therapeutic agent in locomotor ataxia it is useless, either as a direct agent affecting the progress of the disease or as a means of treating individual symptoms."* Jacoby † maintains that if electricity is used at all it should be only in the early stages. "The treatment should then be carried out centrally by direct galvanisation of the cord and peripherally by means of faradisation of the skin." Each application to the spine should last about ten minutes, and be followed by the use of the faradic brush "applied rapidly to those parts that are the seat of neuralgias and paresthesias. Three courses of six weeks each, treatment being applied every second day, with an interval of six weeks between each course, should do all that can be expected from this treatment." He believes electrical treatment is useful to relieve the *pains* of tabes, but the "ataxia itself, whenever developed, is," he says, "I am sure, never influenced by any method of electric treatment." Oppenheim thinks the galvanic current "almost always gives good results," but that "faradic currents are not always well borne."*

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* Hare's "System of Practical Therapeutics," vol. ii., p. 675.

† "System of Physiological Therapeutics," vol. ii., p. 184.

Suspension, a mode of treatment of tabes which has proved to be not unattended with danger, from which much was expected, has not realised the expectations of its original advocates. Many cases have been reported of great amelioration following suspension—diminution of pain, re-establishment of control over the bladder and rectum, restoration of sexual power, and considerable improvement in the gait. Return of knee-jerk is said to have occurred during the treatment. Oppenheim,† while pointing out its inapplicability to advanced cases and those complicated with arterio-sclerosis, believes that the ataxic pains and impotence, and even the ocular symptoms, may be relieved by this method; and adds that he has seen good results from the application of a corset to support the spinal cord, especially in the relief of girdle pains. Professor Starr states that in his own experience of its application in twenty cases there is now, at the end of two years, only one patient out of the twenty who considers it worth while to keep this treatment up. He sees no objection to its employment, but does not think it destined to become a permanent method of treatment of tabes. There can be no doubt that experience has not justified the extravagant claims that were made on behalf of this method; and the occurrence of several deaths from strangulation did much to discredit it.

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* "Diseases of the Nervous System," p. 139.

† *Ibid.*

But the most recent method of mechanical treatment of the ataxia is that introduced by Fränkel, which has for its object the re-education of the patient in the performance of co-ordinate movements; a number of methodical exercises are devised, beginning with the simplest movements and gradually advancing to more complex ones, by which co-ordinated movements are progressively re-taught the patient. "He is made to re-learn, through the control exercised by his eyes and the rest of his sensory apparatus, the proper motor impulses which induce co-ordinated movements." Various forms of apparatus are employed in carrying out this method, which in Germany has been estimated as of much value.*

In conclusion, we must consider the efficacy of those still more general methods of treatment—hydrotherapy, baths and massage, climate, food, etc.

In considering the applicability of **hydrotherapy** to the treatment of tabes, it must be borne in mind that both cold and hot baths are injurious—baths below 65° and above 90° F.; but baths and douches of a temperature varying between 70° and 90° F. are often serviceable. Hot baths will relieve pain, perhaps, more quickly than anything else; "but the ultimate effect of a succession of hot baths is to increase the rapidity of progress of the disease, and to intensify the symptoms" (*Starr*). Of the various methods of applying tepid water the following are specially recommended:—*Spinal douche*—a stream of water, of a temperature varying from 90° to 70°, and of some force, should be directed from a tube along the whole length of the spine for ten seconds daily; *sponging* the spine while the patient sits on the edge of the bath, and at the end of the sponging, sudden alternations from heat to cold, 90° to 70° F., may be employed. After either of these applications the patient should be rubbed briskly with some warm towels. A *full bath*, at 90° for twenty minutes, should be used daily, while a course of potassium iodide is being administered.

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* A full and lengthy account of these exercises will be found in Church and Peterson's "Nervous and Mental Diseases," p. 419.

The object of these processes is to act on the spinal circulation, "either by affecting the calibre of the vascular system in general, or by producing such peripheral irritation of the skin as to cause reflex vaso-motor effects." Thus the circulation in the cord is stimulated, venous or arterial congestion is relieved, elimination of waste substances is promoted, and nutrition is improved. A period of six or eight weeks, twice or three times a year, may be thus wisely devoted to bath treatment; baths should not be continued, uninterruptedly, for long periods at a time.

Tepid packs to the abdomen or extremities often prove most useful in promptly relieving the crises and the lightning pains. Flannels wrung out in hot water are applied, covered with oil-silk.

This kind of treatment can rarely be carried out satisfactorily at home, but it can be applied in any well-organised hydropathic establishment.

Many of the thermal spas on the Continent are visited by ataxics for this purpose. Little importance need be attached to the composition of the water—everything to its mode of application. Much, too, seems to depend on the bath being situated in a moderately bracing, or warm and dry, locality. To the sub-Alpine climate of Gastein, and its charming surroundings, is doubtless attributable much of the benefit derived from bathing in its tepid water; at Wildbad and at Ragatz also we get the advantage of forest and mountain air, and a warm and dry atmosphere. At Nauheim and Rehme we find salt-baths, rich in carbonic acid, and skilful physicians to apply them.

In France the patronage of Charcot and others has given to *Lamalou* a great reputation for the treatment of these cases. Its springs are very feebly mineralised, but they are of the right temperature, viz. between 75° and 90° F. Néris and Balaruc also enjoy a somewhat similar reputation.

Massage is of service in these cases. Deep massage to the muscles of the back, in the early stages, favours the spinal circulation, and tends to relieve any congestions which may exist. Applied at night, it often relieves insomnia, and prevents attacks of pain; with this object in view, the patient should be counselled not to lie on his back, as the dorsal decubitus favours spinal congestion. In advanced stages also massage is of service, for, by promoting venous return, it is a help to nutrition, and of comfort to the patient.

As to *diet*, the chief considerations are to adequately maintain the nutrition without disturbing the digestive functions of the patient. As generous a diet should be prescribed as the patient can comfortably digest; and any digestive feebleness should be carefully studied, and the diet adapted to it accordingly. When they are readily digested, a free consumption of fats should be encouraged, such as butter, bacon, cream, or cod-liver oil, for a tendency to emaciation is usually encountered in chronic cases. Water in abundance is useful for purposes of elimination; and light wines with water, or light beer, may be permitted; also tea and coffee, if they do not lead to digestive disorder.

With regard to *exercise*, it is no doubt wise, when there are any acute symptoms or any signs of spinal congestion, to enforce absolute rest in bed; but in the very chronic cases it would be unwise in the extreme to sequester such patients from their avocations and business. We have known many ataxics who have worked, and worked well, for many years in commerce and in literature, their symptoms remaining almost stationary. We should caution such patients against incurring any fatigue. Oppenheim is very emphatic on these points, and urges the importance of tabetic patients avoiding all excessive muscular exertion and exposure to cold. But even in advanced cases, as lying on the back favours venous congestion of the spine, we should encourage sitting up and moving about as much as possible without fatigue.

An agreeable and pleasant *climate* is always an advantage to ataxic, as well as to other, invalids; and, when it is practicable, change to a southern resort in winter should be advised. Madeira, Teneriffe, the Azores, and some places in the West Indies, are genial climates to winter in, where much time may be spent out of doors. For those who do not want to go so far, Biarritz, or the stations on the Riviera, answer fairly well. A sea voyage has been advised, but we should doubt its utility, except under very favourable circumstances. Ataxic patients should clothe warmly, and should avoid all excessive mental, as well as physical, exertion.

INFANTILE PARALYSIS.

(*Acute Anterior Polio-myelitis. Infantile Spinal Paralysis.*)

These names have been applied to an affection of the spinal cord, which occurs usually, but not invariably, within the first five years of life, and was formerly known as "infantile paralysis," or "essential paralysis of infancy." Its true nature as a **myelitis**, affecting a limited portion of the grey matter of the anterior cornua of the cord, has only been known within comparatively recent times.

This curious disease, the cause of which is not accurately known, but is suspected to be due to an infection by micro-organisms, comes on suddenly, and the paralysis reaches its maximum quickly, even within the space of a day. Its onset is usually attended with some pyrexia, and the temperature rises to from 101° to 103° F. Occasionally, but rarely, the child may be attacked with convulsions. One or more limbs may be found paralysed, the distribution and extent of the paralysis being very variable. Certain groups of muscles, especially in the upper limbs, are liable to be affected together, and the paralysis rarely affects all the muscles of a limb. This is accounted for by the fact that groups of nerve-cells are involved in the disease, "which preside over certain muscles acting functionally together." The affected limb may not, at any rate at first, show any obvious, visible change, but atrophy rapidly sets in, and the muscles become flaccid, soft, and flabby. Generally, after eight or ten days, the "reaction of degeneration" may be detected. The muscles do not react to the faradic current, but their susceptibility to the constant current is increased. For a time the paralysis remains stationary, and then gradual improvement may set in, but complete recovery is exceptional, and permanent paralysis of groups of muscles usually remains. Now that the anatomical conditions of the disease are known, we can hardly expect any other result, for when the large motor cells of the anterior cornua are thoroughly disintegrated, their restoration is impossible. There are no disturbances of sensation, nor are the vesical or rectal functions troubled. A remarkable consequence of this disease, when the paralysis persists, is the extreme wasting of the limb and the arrest or retardation of the growth of the bones. From this and other causes, such as *contracture* of the muscles, serious deformities are apt to arise, such as forms of talipes and shortening of limbs; and, in some instances of paralysis of the deltoid, the head of the humerus falls away from the glenoid cavity.

We have already said that the cause of this disease is unknown, but the chief anatomical condition is a myelitis affecting the anterior cornua, most commonly in the cervical or lumbar enlargements, and leading to atrophy of the anterior cornua and disappearance of the large motor cells in the affected part of the cord. There is also atrophy of the corresponding anterior roots of the spinal nerves, and the wasted muscles undergo slow fatty and sclerotic changes.

It is said by Oppenheim to occur, like an infective disease, at definite times and in epidemics, and that it often develops after other infectious diseases, as measles, scarlet fever, and whooping cough.*

This brief account of the nature and symptoms of *acute infantile spinal* paralysis will enable us to enter profitably on the consideration of its *treatment.*

The **indications for treatment** will depend on whether the child comes under observation at the onset of the acute attack, which is comparatively rare, or when the acute affection of the spine is practically over, which it probably is at the end of a week. In the first case, measures must be adopted to influence, if possible, the acute inflammation in the cord, to lessen its intensity, and limit its extent. In the second case, the chief object of treatment will be to maintain the circulation and nutrition of the paralysed muscles and prevent further wasting. Finally, in advanced stages, mechanical appliances may be needed to prevent or rectify contractures and deformities. If the case is seen during the acute febrile period, antipyretic measures should be adopted and counter-irritation applied over the affected region of the cord. This will be over the *cervical* enlargement if the paralysis is limited to the upper extremities, and over the *lumbar* enlargement if it is confined to the lower, or over both if both limbs are involved.

To reduce the fever and inflammation, general antipyretics should be given. In strong children a minim of tincture of aconite, with 20 grains of citrate of potash and a little syrup of lemon, in two or three teaspoonfuls of water, may be given every four hours; or aconitine in granules ($\frac{1}{460}$ grain), one every four hours. If this drug does not reduce the pyrexia in twenty-four to forty-eight hours it should be discontinued, and a half-grain or a grain of phenacetin, with a grain of hydrobromate of quinine, mixed with a little lemon-juice and water, given in its stead. In feeble children it is best to begin with the latter. A brisk aperient should be given at starting, such as a grain or two of calomel with 10 to 20 grains of compound jalap powder, and this may be repeated if the bowels become confined.

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* "Diseases of the Nervous System" (Mayer's translation), p. 152; 1901.

Sponging the body frequently with a mixture of eau-de-cologne or alcohol and tepid water has also an excellent effect on the fever. It has been recommended to apply an ice-bag to the affected part of the spine if there is an opportunity of doing this at the very outset of the disease, but Oppenheim is opposed to this, and prefers leeching.

After the disease has existed a few days, counter-irritation, in the form of dry-cupping or stimulating liniments or strong iodine paint, should be used. These applications are better borne and more easily applied to children than blisters or sinapisms. Iodine paint can be readily applied over the seat of the disease, or a strip of flannel soaked in a liniment composed of equal parts of linimentum chloroformi and linimentum sinapis compositum is also easily applied. As it is desirable, in order to lessen spinal hyperæmia, that the child should not lie on its back, it is, perhaps, an advantage to make the skin over the spine tender with counter-irritants. It should be encouraged to lie on its side or on its belly.

The administration of *ergot* at this period has been advocated, but it may be doubted if it has any efficacy. There is, however, no harm in giving it, and the usual dose of the fluid extract is, according to the age of the child, 10 (for a child of one year) to 25 minims every four hours. Large doses of potassium iodide, together with mercurial inunctions, have been advised, but we fail to see the indications for their use; nor does there appear to be any strong evidence of their utility. They are also very depressing measures, and ought not to be lightly prescribed.

If there is much restlessness potassium bromide may be given to soothe and quiet, and should the disease begin with convulsions, 10 to 20 grains of this salt, combined with 5 to 10 grains of chloral, should be administered, dissolved in 2 oz. of water, by enema.

But, too commonly, either the case is not seen until after the acute attack, or the acute attack is misinterpreted. When loss of power in one or more limbs, or muscular groups, has become evident, then careful and long-continued treatment is necessary, in order to maintain nutrition, restore power, and prevent deformities. Of course, if all the motor cells in the cord pertaining to a particular group of muscles are destroyed, then paralysis of that group must remain complete; but if some of the cells remain intact those muscles may regain much, if not all, their power; and, as a matter of fact, we find early and persistent treatment often rewarded by either complete or partial restoration of function in the paralysed groups.

The medicine best adapted to favour the restoration of muscular power is **strychnine**, but as it promotes spinal hyperæmia it must not be given until quite a month after the onset of the attack. Professor Starr recommends that it should be pushed "until slight twitching of the normal muscles, or at least decided increase of the spinal reflexes, is produced." He advises that it should be given for four days in the week for some months, as its intermittent use seems to stimulate the cord more than its continuous use. He adds to the strychnine $\frac{1}{40}$ grain of arsenious acid as a nerve-tonic thrice daily.

But voluntary or passive exercises and electrical stimulation of the muscles are the most important remedial agencies. "By exercise a half-paralysed muscle may be brought up to a point at which it will do an amount of work nearly equal to the normal," and the child should be trained to the use of some simple mechanical contrivance,* by which resistance may be offered to the action of the particular muscles affected, which he should regularly and voluntarily make efforts to overcome. Such exercises should be practised two or three times a day.

Nothing is more useful or more important than regular, thorough, systematic **massage** of the muscles involved, in order to stimulate the circulation in them and promote their nutrition. This may be usefully combined with frictions with warm olive oil or cod-liver oil, and the limb should be kept warm with extra clothing. Gowers says: "The muscles should be daily rubbed and kneaded and gently pinched. The rubbing should be especially upward, so as to expedite the flow of the blood in the veins."

Professor Starr's observations on the application of **electricity** in these cases are so sound and practical that we cannot do better than quote them:—"Electricity applied to the muscles will secure their contraction, and hence will exercise them when voluntary exercise is impossible. At the same time, applied in the form of galvanism, it promotes all those chemical changes in the parts near the poles which are essential to growth. To the muscles which respond to faradism a faradic current should be applied for ten minutes daily. Such response may be obtained in muscles which are only slightly paralysed, and these will recover spontaneously in time, but will regain their power more rapidly under faradic treatment. The muscles which are seriously affected do not, however, respond to faradism, and to these it is necessary to apply an interrupted galvanic current, faradic applications being useless. These muscles respond more vigorously when the positive pole is placed on the muscle; hence that is the pole to be used, the negative being placed on the back.

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* These can be constructed at home with a little ingenuity by any intelligent mechanic.

The interruptions should be made by an electrode held in the hand and provided with a finger-key, and each muscle should be treated for about three minutes daily. About one hundred interruptions can be made to the minute by the finger. The strength used should be the least which will secure a contraction in the muscle. When interruptions of the current do not produce a prompt response, alternations of the current may be employed by placing either pole on the muscle and the other on the same limb about a foot away, and reversing the current by means of the pole-charger in the battery. The reversals can be made by the hand at the rate of sixty a minute."*

It must not be overlooked that in this disease electrical applications are unusually painful, and that children are readily frightened by them; and it is advisable, in order to gain their confidence, at first to apply the sponges and electrodes *without any current*, so as to familiarise the child with the apparatus, and afterwards to begin with exceedingly weak currents, the strength of which can be gradually increased. These applications may be made daily for two or three years, and even longer if the nutrition of the muscle is obviously improving. But if after two years all these measures appear fruitless, it will be useless to continue them. We agree with Starr that the application of the electrical current to the spinal cord is without any effect on the pathological changes present there.

For the avoidance of deformities the use and application of suitable apparatus must be made the subject of careful study in each case, and it is best, when practicable, that such apparatus should be designed and constructed with the co-operation of a skilful orthopædic surgeon.

It is scarcely necessary to add that nutritious food must be supplied, and appropriate tonics, such as the mixed hypophosphites, must be given when required.

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* Hare's "System of Practical Therapeutics" (second edition), vol. ii., p. 681.

PARAPLEGIA AND THE MORBID CONDITIONS ASSOCIATED THEREWITH.

Paraplegia, or loss of power limited to the lower part of the body, although a symptom only, is usually associated clinically with a group of morbid conditions, which call for remedial treatment. Much obscurity often exists as to the precise pathological nature of the morbid changes in the spinal cord, upon which the paraplegia depends, and even their recognition, when possible, affords but slender indications as to the nature of the therapeutic measures which should be employed.

Paraplegia may arise as a result either (1) of changes originating within the cord itself, or (2) of lesions arising from *compression* of the cord from without.

1. *Diffuse inflammation* of the substance of the cord, or **myelitis,** in its *acute* and *chronic* form, is by far the most frequent and important cause of paraplegia. *Myelitis* can often be traced to exposure to cold and wet, sleeping on damp ground or in snow, or prolonged immersion, or working up to the knees in cold water. *Bodily fatigue* is another cause, or fatigue coupled with exposure, as in forced marches in cold and wet weather. It is occasionally, but very rarely, a complication of some specific infective fever, such as small-pox or typhoid. Syphilis and sexual excesses are also amongst the causes of myelitis. Oppenheim,* however, and many other neurologists, regard over-exertion, exposure to cold, traumatism, sexual excesses, etc., as simply "*predisposing factors,*" and *infection* and *intoxication* as the true and important ones. But it is rare to find the microbes of infective disease themselves in the spinal cord,

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* "Diseases of the Nervous System" (Mayer's translation), p. 204; 1901.

more frequently only *streptococci* and *staphylococci*, so that it is probable that the myelitis results from a mixed or secondary infection. It cannot be determined whether the myelitis is caused by the bacteria or their toxines.

Of other *intrinsic* causes of paraplegia we may enumerate *hæmorrhage* into the cord, an extremely rare occurrence, and one which may be recovered from by absorption of the clot; it is scarcely possible to diagnose it, and, except the enforcement of absolute rest, no special treatment would be needed. *Tumour within the cord* is also a cause; this may be a syphilitic *gumma*, or a *tubercular* mass, or a *glioma*. For the removal of the latter, when its situation can be localised, surgical operation is now occasionally undertaken, and, so far as *recovery* is concerned, sometimes with success and sometimes with failure. *Anæmia* of the cord, from loss of blood or from embolism, has been advanced as a rare, but occasional, cause of paraplegia; and **diver's palsy**, the form of temporary paraplegia that has been observed to occur sometimes in those engaged in diving operations, has been referred to temporary anæmia of the cord by some, and to congestion or blood stasis by others. *Hyperæmia* of the cord, although believed by some authorities to be an occasional cause of paraplegia, is doubted to be so by others. Spinal *concussion*, as in railway accidents, is sometimes the cause of paraplegia, although some physicians suggest that, in these cases, there may be a minor degree of myelitis.

The *syphilitic* cases, it should be remembered, may not necessarily depend on a gumma within the cord, but may originate in syphilitic arteritis, causing myelitis from defective blood-supply.

Much obscurity rests on so-called cases of **reflex paraplegia.** Cases have been reported in which paraplegia has disappeared on the removal of intestinal worms, on the reduction of a displaced womb, or on the relief of a tight stricture; and paraplegia occurs occasionally in connection with other affections of the urethra and bladder; whether some of these cases are *hysterical*, and whether some are due, as has been suggested, especially in the bladder cases, to "progressive ascending neuritis," we need not now consider; the important point to remember, from a therapeutic point of view, is that such cases do occur, and that some of them are cured by the simple measures mentioned. Reference to hysterical paraplegia is made in the chapter on hysteria.

2. Of the second group of causes of paraplegia, those which act by slowly **compressing** the cord, it is important to note that their first effect is to produce *pain*, by pressure on the posterior roots of the nerves; next they excite secondary *myelitis*, with softening; and finally, they lead to complete destruction of the cord at the point of pressure. The most frequent of these causes is **spinal caries**, or Pott's disease, or angular curvature, generally due to tubercular disease of the vertebræ; *malignant disease* of the spine (carcinoma, sarcoma), primary or secondary, is also a frequent cause; some of these growths begin in the meninges. Aneurismal and hydatid tumours have been enumerated amongst these causes, but they are excessively rare.

There is a form of paraplegia which, as a *primary* affection, is extremely rare, and of uncertain causation; but, as a *secondary* affection, it very commonly follows transverse lesions of the cord; it is termed *spastic paraplegia*, from the circumstance that the paralysed limbs are rigid from *spasm* of their muscles.

A few words with regard to the principal **symptoms** of these several forms of paraplegia, and we shall then be in a condition to enter on the subject of their treatment.

In **acute myelitis**, or acute softening of the cord, the onset is often sudden, and there is some pyrexia present. The paraplegia may be complete; and should the disease extend to the cervical region, there may be more or less loss of power of the upper limbs. After a brief period of hyperæsthesia, sensation also is lost. Paralysis of the rectum and bladder leads to troubles in urination and defecation. The muscles rapidly atrophy. Acute bed-sores may form over the sacrum and on the heels. In the most severe cases the pulse becomes rapid, the tongue dry, and the temperature may reach 107° to 108°, and be accompanied by delirium, and death may supervene in a few days. In less acute forms the paraplegia may be preceded by incomplete loss of power, with pain and heaviness in the legs. The muscles do not waste so rapidly, but become at first *flabby*, and subsequently rigidity sets in. A girdle sensation is often felt between the epigastric and umbilical regions. There is the same tendency to the formation of **bed-sores**, and to vesical and rectal troubles. *Cystitis* is a troublesome and serious complication. There is at first retention and then incontinence of urine, which becomes alkaline, ammoniacal, and offensive. The bowels are constipated, but there is inability to retain the fæces.

Chronic spinal meningitis is regarded by some German authorities as of frequent occurrence as a *primary* disease, giving rise, amongst other symptoms, to *paraplegia*, often incomplete and variable in degree. English and American physicians consider it exceedingly rare as a primary affection, although a common enough accompaniment of *compression* cases, as in those dependent on vertebral caries, or syphilitic gummata. We shall refer to this point again presently.

In paraplegia due to **compression** the clinical features of the case are somewhat different; we encounter symptoms due to interference with the *roots* of the *spinal nerves* emerging at or just above the level of the disease; the chief of these is *pain referred to the parts to which the affected nerves are distributed.* There may also be extreme hyperæsthesia, with areas of anæsthesia (*anæsthesia dolorosa*). Pain in the back and tenderness over some of the vertebral spines may be present. These extrinsic symptoms are followed by those of pressure on the cord itself, the chief of which is usually a *slowly* developing loss of power in the lower extremities. The bladder symptoms are less marked than in intrinsic cases, and may not appear till late in the course of the disease.

In *primary spastic paraplegia*, which is believed to be dependent on a primary *lateral sclerosis*, the symptoms are distinctive. In the first place, the loss of power is not marked, but there is a feeling of fatigue and stiffness and a dull aching pain in the back and calves of the legs. The stiffness is particularly felt on rising in the morning. The gait is characteristic—the legs move stiffly and hesitatingly, and there is dragging of the toes. The spasm of the adductors causes the knees to touch, and sometimes produces cross-legged progression; and when extreme the legs are separated with great difficulty. The power of walking is then lost. The nutrition is maintained, and the muscles may even be hypertrophied. The reflexes are greatly increased. The slightest touch will sometimes throw the legs into violent clonic spasm. A history of syphilis is said to be often present. The course of the disease is usually very chronic, and the patient may be able to get about for years. Disorders of the bladder and rectum do not usually occur till late.

Except in the cases of myelitis and paraplegia from mechanical injury or *compression*, we have few *causal* indications to guide us in the **treatment** of these affections; nor can we pretend to be able to exercise any remedial or curative influences over the changes in the cord induced by these varieties of inflammation. In cases of acute myelitis, where the inflammation attacks the parenchyma of the cord, and leads to a rapid softening and disintegration of its cells and nerve-tubules, we are powerless; and we can only hope to act effectively when we are fortunate enough to see the case in the initial stage of active hyperæmia, before those destructive changes have taken place, an opportunity which rarely occurs.

In the various forms of chronic myelitis in which the inflammatory process affects chiefly the neuroglia, it is doubtful if we can exercise much control over the interstitial proliferation and arrest the compression and destruction of nerve-cells and nerve-tubules which must attend the sclerosing process. It follows, therefore, that our therapeutic efforts in most of these cases are directed rather to the relief and prevention of the consequences of these pathological changes in the cord, than to the direct removal of the changes themselves; in short, our treatment is usually *palliative*—rarely *curative.*

Preventive measures can be deduced from the enumeration we have given of the causes of myelitis, so far as we know them; but, practically, when is a physician ever asked to *prevent* such attacks?

In cases of **acute myelitis** our first duty is to do what we can to diminish the intensity of the inflammatory process and the local hyperæmia attending it. The patient should be placed on a comfortable water-bed, or, if this is not obtainable, by means of small cushions or pillows the weight of the body should be taken off the bony prominences and evenly distributed. To avoid postural hyperæmia he should be induced to lie prone in bed, or on one side, and his position should be frequently changed, in order to avoid the formation of bed-sores, to which these patients are so subject.

Counter-irritation, or the application of the ice-bag over the affected portion of the cord, may prove useful. The **ice-bag**, if the patient should be seen at the commencement of the case, is a valuable application. It should be applied for an hour or two at a time and removed at short intervals, but freezing must be avoided. Leeches, wet and dry cupping, blisters, and the actual cautery have all been advocated and used locally. The objection made to blisters, on the ground of their favouring the formation of bed-sores, seems well founded, although they have such distinguished advocates as Erb and Niemeyer.

Leeches, or wet or dry cupping, can be combined with the use of the ice-bag, and should be adopted in the early stages and with fairly vigorous patients. In feeble ones we should be content with *dry* cupping, and in such cases the actual cautery may also be used. In France, especially, the actual cautery is much used in these cases, and the "*points de feu*," which can be made by Paquelin's cautery, are a very convenient, rapid, efficacious, and clean form of counter-irritation. These small-pointed cauterisations leave no sore if lightly applied, as they should be, so as to burn only the skin. They are made in parallel series on each side of the spine, and may be renewed after five or six days if necessary.

The bowels should be freely evacuated by a few grains of calomel followed by a saline, and they should be kept freely moved by daily doses of some saline aperient. These free discharges from the bowels help to relieve spinal hyperæmia, and they prevent the troublesome accumulation of hardened fæces in the paralysed large intestine.

There are three extremely important points in the treatment of all cases of this kind—viz. due attention to the state of the bladder and to that of the rectum, and to the prevention of bed-sores. They are closely associated, for the occurrence of bed-sores is often due to a want of care and cleanliness in attending to the state of the bladder and bowels.

With regard to the bladder, we may have to deal both with retention and incontinence. To relieve the former a soft catheter, rendered thoroughly *aseptic*, must be introduced into the bladder, which should be emptied as completely as possible. There is a great tendency in these cases for the urine to decompose in the bladder, and so set up a septic pyelitis which may itself prove fatal. There are several drugs which may be given by the mouth, and which, being secreted with the urine, prevent its decomposition by their antiseptic properties. One of the best of these is salol, which may be given in 10- or 15-grain doses three times a day; or boric acid in 10-grain doses; or sodium benzoate or salicylate may be employed in the same doses; urotropine, in 5- to 10-grain doses, is much used now for preventing decomposition of the urine. If these measures fail, we must wash out the bladder several times a day with a warm solution of borax—60 grains to the pint—or some other weak antiseptic solution. In incontinence it is easy in the male to apply an indiarubber urinal, but in the female it is very difficult to prevent bed-soiling by urine. Large sponges (frequently wrung out, and before re-application cleansed in antiseptic fluid) or absorbent cotton, covered with oil silk, may be kept applied to the genitals, which should be frequently sponged with warm water, and the spongings followed by oiling with weak carbolic oil. As the fæces when in the rectum cannot be voluntarily retained, it is advisable to wash the rectum out with a large enema of soap and water daily, so as to avoid, as far as possible, fouling of the bed by involuntary evacuations. Of course, when purgatives are being given, attention must be paid lest a fluid motion be passed in the bed; and it is for this reason that, excepting in the earliest stage, it is better to withhold active purgatives and to trust to enemata to unload the large intestine. In advanced cases, if this has been neglected, large and hard accumulations are apt to form in the rectum, which have to be mechanically removed.

The **prevention of bed-sores** is of great importance, because, when once formed, in this affection, they are healed with great difficulty, and may of themselves lead to a fatal result. The care with regard to the urinary and alvine evacuations we have insisted on is a great help in this direction. The lower part of the back should be frequently washed and thoroughly dried by soft towels, and, after washing, the skin should be quickly sponged with eau-de-cologne or rectified spirit, or with rectified spirit containing about 10 grains of tannin to the ounce—this is a very excellent lotion for hardening the skin and diminishing the risk of bed-sores. Any spot which looks red and tender may be protected from pressure by a soft ring-shaped pad, or a large piece of amadou plaster may be applied, with a hole in the centre. If a sore has actually formed, it should be cleansed by washing with sublimate solution, and dressed with lead or zinc ointment or carbolised vaseline.

Of medicinal agents there are few on which any great reliance can be placed. The use of *ergot of rye* was suggested on *à priori* grounds, because of its power of causing contraction of the arterioles, and in some cases in which the paraplegia has not been complete, and which may, possibly, have been due to hyperæmia, recovery is reported to have followed its employment. Dram doses of the extract may be given three times a day; or ergotin or ergotinine may be given hypodermically. Starr commends also the use of potassium iodide in 10-grain doses three times a day. Its success in certain rare cases of recovery is probably due to an anti-syphilitic action, or to its eliminative or antagonising influence on some other toxic agent, possibly gouty or rheumatic. When there is the slightest evidence of syphilis, not only should potassium iodide be given, but free mercurial inunctions should be prescribed. In more chronic syphilitic cases the perchloride of mercury should be given, and its use is often attended with marked benefit.

In *chronic* cases, the question arises as to the value of electricity and thermal baths.

Electricity appears to be useless in some forms and useful in others; and as it is impossible to predict beforehand in what particular case it may prove of service, and as no harm can attend its use after the acute stage has quite passed away, it is as well to give it a chance in all chronic cases. The galvanic current should be passed along the spine by means of large sponge electrodes, one on the neck and the other on the lumbar region; they may be moved gently up and down, and the current from time to time reversed. When the situation of the disease in the cord has been distinctly localised, one pole may be placed on the seat of the lesion and the other on the corresponding level of the anterior surface of the body. The nutrition of the wasted muscles should be promoted by massage and faradisation.

Resort to **thermal baths,** and especially to the cooler "indifferent" baths, such as Wildbad, Gastein, Ragatz, Schlangenbad, etc., or to the gaseous brine baths of Nauheim and Rehme, and to certain sulphur baths, as Aix-la-Chapelle (the latter particularly in syphilitic forms), is frequently prescribed in Germany for those cases, mainly, which are believed to depend on **chronic spinal meningitis,** possibly of gouty or rheumatic nature, and originating in exposure to cold. These baths are believed to promote the absorption of inflammatory exudations, and at most of them massage and electricity are also used to promote the nutrition of the paralysed muscles. They are usually situated in agreeable localities, where a great part of the patient's time can be passed in the open air, and the hygienic conditions present, as well as the regular systematic treatment, are no doubt as well calculated as any remedial measures can be to effect some improvement in these always protracted and often hopeless cases.

The gentle application of hydrotherapy is also useful in the mild chronic cases of slow progress, and may be applied in the manner described in the section on tabes (page 293). Baths at a high temperature are apt to be injurious; but in old cases, with rigidity and contractions of the limbs, the best results are obtained from daily immersion in a bath of 90° F. for half-an-hour at a time.

Counter-irritation to the spine, in the form of the actual cautery (Paquelin's), as already described, appears to be of use occasionally in the treatment of chronic cases. There is much difference of opinion as to the propriety of giving *strychnine* in these cases. Dujardin-Beaumetz accepted the teaching of Vulpian that it is not only useless, but may be injurious in cases dependent on structural lesions of the cord, on account of its irritant action on the medulla, and that it is only useful in functional paresis; Fagge also thinks it of doubtful value; but Professor Starr * recommends its employment in chronic diffuse myelitis when reflex excitability is not great; he gives $\frac{1}{40}$ grain four times a day for a fortnight at a time. He, however, points out that it must be avoided in transverse myelitis with much irritation of the limbs. We are not ourselves disposed to regard this drug as of any *special* value in cases of chronic myelitis; but it may be useful, in some, as a general tonic, and may be given in that sense, just as we often have to give such tonics as iron, quinine, or arsenic.

If the patient is able to sit up, he should be encouraged to do so, and to take exercise regularly in a wheeled chair. He should be warmly clothed, protected from any exposure to cold or damp, and guarded from all excitement, physical or mental.

With regard to the treatment of **compression** cases, some special observations are necessary. Those dependent on aneurismal pressure, or that of a malignant growth, invading the spinal cord, are hopeless; and we can only contribute to the relief of these unfortunate patients by the free use of pain-quelling agents. The various analgesic agents described in the section on neuralgia may be tried in these cases; but, in almost all, we shall finally have to resort to the hypodermic use of morphine with or without atropine. Locally, the application of opium and chloroform or belladonna and chloroform liniments will be of value.

Should we have reason to believe that the compression is caused by a syphiloma, we must use mercury and potassium iodide freely.

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* Hare's "System of Practical Therapeutics" (second edition), p. 685.

Cases of angular curvature from tuberculous vertebral caries are often very successfully treated by **rest** and **suspension.** Rest should be absolute, if practicable, in the recumbent and prone position. Cases have been cured by rest alone. *Suspension* also has yielded most brilliant results, and has often succeeded when other methods have failed. The chief value of suspension is, as is now generally recognised, that it allows of the application of plastic support. This method needs the greatest skill and care in its application. The method of *elastic extension* has been warmly advocated by Victor Horsley if the patient comes under treatment early. Opening the spinal canal by *laminectomy*, when there is reason to conclude that an abscess may have formed and is compressing the cord, has been followed by excellent results in some instances. For full descriptions of these surgical methods of dealing with cases of compression myelitis we must refer to special treatises.

Anti-tubercular remedies should, at the same time, be prescribed, such as cod-liver oil, the syrup of the combined hypophosphites, fresh air, preferably at the sea-side for children, and good nourishing food, containing a good supply of fat. Cases of paraplegia from vertebral caries have been reported in which remarkable improvement has been manifested while taking large doses of iodides—30-grain doses of potassium and sodium iodides every two hours—sensation and movement, which had been lost for months, having been restored to the paralysed limbs.*

Charcot commends the application of the actual cautery along both sides of the spinous processes.

In cases of **diver's paraplegia** inhalations of oxygen and compressed air have been advised, and morphine injections to relieve pain. Acting on the idea that vascular paresis is the chief factor in the causation of the disease, Dr. A. H. Smith * has given ergot in these cases to induce contraction of the arterioles, and this plan has proved useful. He gives a teaspoonful of the fluid extract at once, and repeats the dose in half or three-quarters of an hour if the pain is not relieved. If the paraplegia does not disappear soon, it must be treated on the principles already laid down.

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* Fagge's "Practice of Medicine" (third edition), vol. i., p. 479.

In cases of primary **spastic** paraplegia, dependent on lateral sclerosis, galvanism to the spine is said, on the authority of Erb, to have been attended by amelioration and sometimes cure. Treatment at the gaseous brine baths of Nauheim and Rehme has also been attended with benefit. Nitrate of silver and bromides have been recommended. A month's rest in bed on commencing the treatment is of great service, with good food, cod-liver oil, and tonics to improve the general health.

Secondary spasmodic paraplegia, in which the limbs are generally flexed and not extended, is not uncommon. We have referred to the usefulness of prolonged immersion in warm baths, at 90° F., in these cases. Fagge mentions several cases in which he considered the administration of the extract of Calabar bean appeared to remove the rigidity; but on careful consideration of those instances, they seem to us to belong to the class of cases, occurring amongst the poor, in which prolonged rest in bed or in a hospital is itself a most influential curative agent.

PROGRESSIVE MUSCULAR ATROPHY. AMYOTROPHIC LATERAL SCLEROSIS. BULBAR PARALYSIS.

These related affections, dependent on slow atrophic changes in the motor track of the spinal cord and medulla, offer little scope for therapeutic considerations. Most physicians regard them as altogether incurable and irremediable. Should there be any suspicion of a syphilitic taint, mercury and potassium iodide should, of course, be administered. It is possible, as some have taught, that improvement occasionally attends the prolonged use of quinine, arsenic, iron, and strychnine. Gowers advises hypodermic injections of strychnine (gr. $\frac{1}{60}$), with morphine (gr. $\frac{1}{30}$). In those cases attended with muscular spasm (spastic paraplegia) systematic *massage* appears to have been the most useful of all therapeutic measures. Some writers advocate the persevering use of the continuous current. Some difficulty will commonly be found in feeding "bulbar" cases. It will be found that pulpy semi-solid food is swallowed better than liquids. Pounded fish and meat may be made up with white of egg, or clear soup, into a paste. Meat or fruit jellies can also be taken, but all *hard* substances must be avoided. If swallowing is no longer possible, food may be given by means of a soft rubber tube and funnel, the tube passing through the mouth or nose. These patients require to be watched while eating, lest food should suddenly become impacted in the glottis and cause suffocation.

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* Allbutt's "System of Medicine," vol. vii., p. 42.

ADDITIONAL FORMULÆ.

For locomotor ataxy.

℞ Argenti nitratis, gr. vijss.
Extracti et pulveris glycyrrhizæ, q.s.

Dissolve the nitrate of silver in a very small quantity of distilled water, and then add the other ingredients and make into fifty pills. One night and morning. (*Bamberger.*)

For locomotor ataxy.

℞ Zinci phosphidi, gr. xij.
Pulveris glycyrrhizæ, gr. xx.
Syrupi et pulveris acaciæ, q.s.

Ut f. pil. centum. One to five daily. (*Vigier.*)

For the lightning pains of locomotor ataxy.

℞ Sodii bromidi, ℥ij.
Extracti ergotæ fluidi, ℥jss.
Aquæ camphoræ ad ℥iv.

M. f. mist. A teaspoonful every four hours. (*Hamilton.*)

In locomotor ataxy.

℞ Acidi phosphorici diluti, ʒj.
Syrupi, ℥iij.

M. f. mist. A teaspoonful, increased to a dessertspoonful, in water thrice daily.
(*Lambert.*)

Tonic in locomotor ataxy.

℞ Sodii glycero-phosphatis, gr. xv.

To be taken three times a day for a long period. (*Starr.*)

For myelitis.

℞ Sodii iodidi, gr. xxx.
Syrupi aurantii, ʒv.
Aquæ ad ℥vj.

M. f. mist. To be taken daily. (*Bamberger.*)

For myelitis (early stage).

℞ Ergotini, gr. xlv.
Sacchari albi, gr. lxxv.

M. et divide in pulv. xv. One three times a day. (*Benedikt.*)

For subacute cases.

℞ Extracti physostigmatis, gr. l.
Pulveris et extracti glycyrrhizæ, q.s.

Ut f. pil. xc. One three times a day. (*Benedikt.*)

CHAPTER III.

THE TREATMENT OF NEURALGIAS, AND OF NEURITIS, LOCALISED AND MULTIPLE.

Neuralgia either (1) Symptomatic or (2) Idiopathic—Etiology—Symptoms—*Treatment*—Causal Indications—Baths in Gouty and Rheumatic Cases—Potassium Iodide—Mercurial Inunction in Syphilitic Cases—Cases associated with *Anæmia*—Arsenic—Iron—Strychnine—Cod-liver Oil—Chalybeate Baths and Waters—Oxygen Inhalations—*Malarial* Cases—Quinine and Arsenic—*Neuropathic* Cases—Rest Cure—Hydrotherapy—Bromides—Valerianate of Zinc—Massage. *Pain-relieving Remedies:* Counter-irritation — Stimulating and Anodyne Embrocations — Blisters — Thermo-cautery — Electricity — Acupuncture—Aquapuncture—Local Application of Cold—Narcotic and Analgesic Drugs: Opium, Belladonna, Aconite, Veratrine, Cannabis Indica, Menthol, Chloral, Butyl-chloral, Chloroform Injections, Gelsemium, Antipyrin, Pyramidon, Phenacetin, Exalgine, Cocaine, Osmic Acid—Phosphorus, Ammonium Chloride, and other Drugs.

Special Forms of Neuralgia — *Trigeminal Neuralgia* — Iron, Quinine, etc. etc.—Surgical Measures—*Sciatica*—Opium and Sulphur—Rest Cure with Ice-bag, etc. etc.—Thermal Bath Treatment—Mechanical Treatment—*Cervico-occipital, Cervico-brachial, Intercostal, Coccygeal, Lumbar and Plantar Neuralgias.*

Neuritis—Localised and Multiple—Localised Neuritis—Causes—Symptoms—*Facial Paralysis*—Its Treatment—*Oculo-motor Paralysis*—Operation in Sciatic Neuritis—Summary of Treatment—*Multiple Neuritis*—Etiology—Usually Toxic—Alcohol the most common Cause—Symptoms—Treatment. Additional Formulæ.

THE term **neuralgia** is commonly restricted to a paroxysmal painful affection of some peripheral nerve dependent on some functional or organic disturbance of that nerve alone, arising either at its origin, or along its course, or at its periphery.

Neuralgias have been divided into two forms: (1) **Symptomatic** and (2) **Idiopathic.** The former are caused by some *organic* change in the nerve, and may arise from actual inflammation of the nerve-trunk or its sheath; or it may be determined by injuries or wounds involving the nerve or its branches; or it may be due to compression arising externally to the nerve, as from tumours and outgrowths; or it may be caused by organic *central* lesions. In the second, or so-called *idiopathic* form, there are no discoverable structural changes in the nerve, and its mode of origin and pathological nature are by no means clear. It is very often found associated with **anæmic** states, and with enfeebled and debilitated nervous systems; it is prone to occur in the female sex especially, and in the members of neuropathic families; it can often be traced to certain morbid states of the blood, as malarial infection, gout, rheumatism, diabetes, lead-poisoning, etc.; exposure to cold will act as an exciting cause in predisposed persons; arterio-sclerosis and senility are also to be enumerated amongst the predisposing causes, but in very many instances all attempts to trace its causation are fruitless.

We are disposed to think that vaso-motor disturbances are frequently at the root of many cases of idiopathic neuralgia. The remarkable manner in which the pain often comes and goes, or increases and diminishes in intensity, supports this view; and it is especially amenable to remedies that are known to exert a control over the vaso-motor centres.

When the neuralgia is due to *neuritis* or *perineuritis*, as is often the case in sciatica, and in affections of some branches of the fifth nerve, there are much more pain and tenderness along the course of the nerve-trunk than in idiopathic neuralgia.

Neuralgias are sometimes referred to reflex irritation, as in the case of carious teeth exciting neuralgia of branches of the fifth nerve which are not directly connected with the offending tooth; but in this connection it is curious to note that, although children frequently suffer from toothache and often have a number of carious teeth, they rarely have neuralgia, while they are particularly prone to certain forms of *reflex* irritation.

The following are the chief characteristic **symp-**

toms of neuralgia. There is usually complaint of some uneasy sensation or tingling in the part affected before the severe attack of pain comes on; the pain is usually confined to one or more of the ramifications of a particular nerve, and is almost always unilateral; although there may be constantly some tenderness on pressure over the affected nerve, especially at certain points (*points douloureux*), particularly where the nerve escapes from a bony canal, or perforates a fascia or approaches the surface, the *severe* attacks of pain come on in paroxysms, spread along the course of the nerve, increase in intensity until they are almost unbearable, last a variable time, with *remissions* and exacerbations, and then gradually subside. Singular trophic or vaso-motor changes are sometimes associated with the attacks. The corresponding area of skin may at first become pale and cold, and subsequently red and injected. In trigeminal neuralgia we may note increased secretion from the related mucous membranes and secreting glands. But one of the most curious phenomena, occasionally associated with neuralgias, is the appearance of a vesicular eruption (herpes) along the course of the affected nerves. The attacks are apt to occur periodically at regular intervals, and at about the same time of the day. This periodicity of attack is not limited to malarial cases. Movements of the parts affected, or mental excitement, will often induce an attack. Liability to such attacks of neuralgia may exist for many years, and sometimes continues through the whole of life.

The successful **treatment** of *all* forms of neuralgia will, in the first place, depend on a careful and painstaking investigation of the peculiar constitutional or other conditions under which the trouble has arisen, and especially as to its possible dependence on central organic lesions. The employment of mere pain-relieving remedies, while no attempt is made to fulfil causal indications, will often have the effect of doing more harm than good. It may in some cases be exceedingly difficult to trace out the true causal relations of the affection, and we may then have to rely chiefly on analgesic measures; but this will not often be the case, and it is generally better to attack a hypothetical cause than to wholly set aside etiological considerations.

We shall, therefore, consider, in the first place, how we may best fulfil the **causal** and **general indications** in the treatment of neuralgias; we shall, secondly, review the various measures that may be useful and necessary for the direct relief of the great symptom **pain**; and thirdly, we shall examine the special modifications of treatment applicable to the different anatomical varieties of the disease.

1. It is hardly necessary to say that, if the disease is dependent upon pressure on the nerve in any part of its course, by outgrowths, tumours, foreign bodies, etc., surgical treatment can alone prove efficacious, except in the cases of gouty, rheumatic, or syphilitic deposits or growths, when treatment appropriate to the constitutional state may cause the disappearance of the compressing agent, and so lead to the cure of the neuralgia.

If neuralgic attacks occur in persons who are of **rheumatic** or **gouty** diathesis, treatment must be directed, not only to the relief of the morbid state of the blood, but also to the *local* changes that are apt to exist, such as deposits about the articulations or inflammation of fibrous structures, such as the sheaths of nerves, fasciæ, etc. Local applications, as well as general remedies, are, therefore, indicated in such cases. Counter-irritation over the seat of pain by flying blisters, or iodine paint or stimulating terebinthinate liniments, is most useful. Hot baths are also of great service; and in chronic cases hot mineral water baths, of which the indifferent thermal baths have attained perhaps the highest reputation, such as Buxton and Bath, in England, and Ragatz, Wildbad, and Gastein, on the Continent; or the *salt* baths, such as Droitwich and Woodhall in England, Weisbaden, Ischl, and Bourbonne, abroad; or in other cases, specially those caused by metallic poisons, the sulphur springs prove most useful, as Harrogate and Strathpeffer, in Britain, Aix-les-Bains, in France, Aix-la-Chapelle, in Germany. At most of these spas massage and electrical treatment are applied as potent auxiliaries.

In the rheumatic cases salicin or the salicylates should be tried in combination with alkalies; and in gouty cases, the value of lithium and potash salts, as well as colchicum (which occasionally acts with magical rapidity in purely gouty neuralgias), should not be overlooked.

We would call particular attention to the value of *potassium iodide* in the treatment of these forms of neuralgia; we consider the limitation of the use of this drug to the treatment of syphilitic neuralgias alone a great error; and when we encounter, in hospital practice, a refractory case of neuralgia, more particularly of the sciatic nerve, we invariably order full doses of potassium iodide, and frequently with most satisfactory results.

Even if there is only a remote possibility of a syphilitic origin of the neuralgia, potassium iodide, in full and increasing doses, should always be given, and mercurial oleates, or some other mercurial preparation, combined with camphor or menthol, should be rubbed in over the painful nerve.

Neuralgias dependent, as they very often are, on **anæmia**, *chlorosis*, and depressed states of general health, and defective nutrition, require vigorous tonic treatment, hygienic, dietetic, and medicinal. Free, but not fatiguing, exercise in the open air, *relaxation from work*, freedom from anxiety and mental excitement, plenty of sleep, removal, when practicable, to some sunny, yet bracing, mountain station, and a liberal diet, including a free supply of cream, butter, oil, or any agreeable form of fat, are all of remedial value. Full doses of iron are needed in many cases, and if this does not agree well, arsenic may be given instead; the sodium arsenate is, perhaps, the best preparation—$\frac{1}{16}$th of a grain, gradually increased to $\frac{1}{8}$th of a grain, may be given after meals thrice daily; or arsenic and iron may be given together, and a very effective tonic is a combination of the liquor arsenici hydrochloricus and the tinctura ferri perchloridi. In some instances, as in delicate anæmic women, who cannot digest any of the ordinary preparations of iron, resort to a chalybeate spa, such as Schwalbach, Pyrmont, or St. Moritz, is often attended by most satisfactory results; the combination, at these spas, of the warm chalybeate baths, charged with carbonic acid gas, the open-air life, the easily digested, light, sparkling iron-waters, and the physical and mental rest, proves one of the most efficient modes of treatment of some forms of anæmic neuralgia.

Strychnine is a valuable addition to an iron tonic in these cases; it promotes appetite, and tends to restore muscular tone. Cod-liver oil is also of great value, especially when neuralgia occurs in growing girls.

Inhalations of oxygen, or of compressed air, have also been found useful in some cases.

If the neuralgia can be traced to **malarial** infection, and if it is very distinctly intermittent in its attacks, it will often be found to yield to full doses of quinine or arsenic. Oppenheim advises quinine in doses of 15 to 30 grains in such cases.

The **neuropathic** or **neurotic** constitution is especially prone to suffer from neuralgic attacks, and these cases especially require treatment appropriate to the constitutional state. A "partial rest cure" is very useful in such cases. This consists essentially in giving the patient a large amount of digestible food, with more rest than is ordinarily taken, and employing massage. The judicious application of hydrotherapy in a special institution, together with electrical treatment and massage, may be arranged so as to combine this "partial rest cure" with these other nerve-calming and nerve-bracing influences. When it is not practicable to carry out the preceding modes of treatment, the bromides may be cautiously administered, but the *valerianate of zinc* will often answer better, as it does not depress the general health like the bromides. However, it must be admitted that some neurotic patients bear bromides exceedingly well, and are enabled to lead a much more active life under their influence than they otherwise would. There is certainly no reason why the sodium bromide, in 15 or 20 grain doses, should not be given at bedtime, and once during the day; but it should not be given continuously, or the habit of bromide-taking may be established.

Massage may be looked upon, in many cases, rather as a *general* than a local remedy, for *general* massage improves the tone and raises the vigour of the whole body; and it has been found to act as a curative agent in many forms of neuralgia, quite independently of local treatment. It is, however, in sciatica that the value of massage, as a means of cure, has been especially established; and we shall return to its consideration when we deal with this special form of neuralgia.

2. The remedies at our disposal for the direct relief of the **pain** of neuralgia are embarrassingly numerous. Many are in the form of *external* or local applications over the affected nerve, and these we will consider first.

Counter-irritation is certainly a most valuable measure for the relief of many forms of neuralgia. This may be applied in the form of stimulating embrocations or mustard plasters, or blisters, or the actual cautery, or the electric brush.

Stimulating liniments applied with brisk friction over the surface, and mustard plasters, are particularly suitable to mild and recent attacks, but they must not be expected to yield any brilliant results in the more severe and obstinate forms. Probably the rheumatic and congestive forms, arising from chill, are the most amenable to friction with stimulating liniments; the turpentine, and the turpentine and acetic acid, liniments of the B.P. are excellent for this purpose, together with some diaphoretic medicine such as 10 or 12 grains of Dover's powder with a few drams of liquor ammonii acetatis. In some cases a combination of stimulant and anodyne answers well; and to this end we can prescribe a mixture of equal parts of mustard liniment and opium liniment, or of compound camphor liniment and belladonna liniment.

Slight measures of this kind will often suffice to relieve mild neuralgic attacks coming on from exposure to chill.

Blisters are exceedingly useful, and their repeated application will often suffice to cure severe and protracted cases. They are probably of chief value in the neuralgias dependent on chronic neuritis or perineuritis. The ordinary emplastrum cantharidis is the best agent for this purpose; and in many cases it is sufficient, and far more agreeable to the patient, to apply *small*, and what are termed *flying*, blisters—*i.e.* blisters not bigger than a shilling or a florin, moved from spot to spot, along the course of the painful nerve. Some apply them over the "painful points," others prefer to place them over the spinal origin of the nerve. In sciatica we have obtained the best results by applying the blister first over the emergence of the nerve-trunk at the sciatic notch, and then following the course of the nerve and its crural branches downwards until the pain has disappeared. When *flying* blisters are used, they should not be left on more than two or three hours over each spot, according to the sensitiveness and delicacy of the skin. In some individuals no vesication will be occasioned by these flying blisters; but if vesication occurs, much care should be taken in dressing the blisters. Nearly all the annoyance of blisters arises from careless dressing. The principle to be remembered is, that the dressing of a blister should be applied *firmly* and *immovably*. After pricking the vesication at the most dependent part, and allowing all the fluid to run out, a piece of lint, a little bigger than the blister, should be spread with vaseline or some simple ointment, and applied over it; upon this a somewhat larger pad of cotton-wool should be placed, and the whole *firmly secured* by *broad strips of adhesive plaster.* Too frequently the dressing is secured by a handkerchief or a bandage, which loosens and rucks up, and the blistered surface becomes irritated, and does not heal quickly. If the plan we have described is adhered to, the blister will quickly heal, and may be, before long, repeated if needful.

The actual cautery, and especially the thermocautery of Paquelin, is a very efficacious remedy in many forms of chronic neuralgia. If the pain is very limited in area, it may be applied in *points* (*pointes de feu*); but if the pain is more diffused, what is termed "transcurrent cauterisation" acts best; for this purpose the Paquelin cautery is heated nearly to a white heat, and is then drawn swiftly and lightly along the course of the branches of the affected nerve.

Some employ a heated metal button or bulb, and apply it along the course of the nerve; this may be heated to any degree in the flame of a spirit-lamp, or it may be used in some cases simply at the temperature obtained by plunging it in boiling water. To avoid the pain of cauterisation, some first apply ether spray to the parts to be cauterised.

Electricity is one of the most efficacious of the local agents employed in the cure of obstinate chronic neuralgias. "The specific action of electricity upon neuralgias," says Jacoby,* "is generally recognised, but whether it is dependent upon the production of an altered state of excitability in the hyperæsthetic nerve or upon the direct production of anæsthesia through strong counter-irritation, cannot be stated with any degree of assurance."

The "sedative" method consists in the application of the "stabile galvanic anode. A current strength of from 2 to 8 milli-ampères may be used, depending upon the situation of the nerves, the duration of the affection, and the sensitiveness of the patient. The current should be allowed to pass from 5 to 10 minutes, and then gradually be diminished to zero, when the electrodes are to be removed. The *anodal electrode*, which should be small and round, and have a well-moistened sponge or cotton covering, is to be placed directly over the painful point of the nerve, while the *kathode*, a large flat sponge or cotton-covered electrode, may be placed over the related plexus or the nape of the neck. Several nerve points may thus be treated successfully at one sitting." The current must be *gradually* introduced and *gradually* diminished.

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* Cohen's "System of Physiologic Therapeutics," vol. ii., Electrotherapy, p. 170. Rebman, 1901.

In cases in which this method fails, *counter-irritant methods* may succeed. *Jacoby* puts "*stabile franklinisation*" first of this class. "A metal ball electrode should be placed over the painful points, after which the discharging rods, which have been kept in contact until this time, should gradually be separated from each other until the pain becomes unbearable. More than one or two minutes of such treatment can rarely be borne."

The *faradic brush* offers another form of counter-irritation. The painful points are treated "with a strong secondary current for from one-half minute to one minute." Jacoby considers this method too painful and does not recommend it. He considers that "in the very early stages of *acute neuralgia*" no form of electricity should be applied, but when the pain "has a tendency to persist, becoming *sub-acute* or *chronic*, electrical treatment should be resorted to. . . *Old chronic neuralgias* are best influenced by *labile galvanic* applications or by *counter-irritant* methods." At first, application should be made daily or twice a day, and later on every second day. He considers that the "so-called *rheumatic neuralgias* and the *traumatic* neuralgias are the most favourable cases for successful treatment by electricity."

Other local measures, such as **acupuncture**, have been employed, not with the idea of producing any revulsive effect, but with the possibility of relieving some tension of the nerve-sheath, or otherwise influencing locally the morbid state of the nerve. This is a method occasionally employed by surgeons, especially for the relief of sciatica. Long, stout needles are pushed deeply down to the situation of the affected nerve, the sheath of which, it is hoped, may be pierced. Several needles are thus introduced along the course of the nerve, and, after a few minutes, withdrawn.

Aquapuncture, or the deep injection of a small quantity of water into the nerve or its vicinity, has been said to be sometimes followed by relief.

The local application of **cold**, either by means of ice-bags or evaporating agents, often acts as a useful palliative in certain cases, although it can rarely be relied upon as curative. Ether spray, a jet of compressed carbonic acid or of methyl chloride can be used to produce intense cold, but it is best to stop short of freezing. The application for three or four seconds of a jet of *methyl chloride* has been advocated by Débove and Bardet for the relief of sciatica; but it is a severe measure, and should be reserved for very refractory cases.

Many remedies directed to the relief of the *pain* of neuralgia are applied both internally and externally, and these two modes of application it will be convenient to consider together. We shall, therefore, now pass on to the examination of the many anodyne, narcotic, and "analgesic" drugs employed in the *treatment* of this disease.

Opium and its derivative **morphine** are almost indispensable in the treatment of severe neuralgias. To relieve the excruciating, distracting pain without delay is, in some instances, a pressing necessity; and for this purpose no drug is so reliable as morphine given hypodermically, yet none of the many remedies used in the treatment of neuralgia needs more care and caution in its application.

It has been stated, and with perfect truth, that most of the cases of morphine-craving have originated in the use of that drug for the relief of neuralgia. There is also another danger which not unfrequently attends the hypodermic use of morphine, and that is serious depression of the cardiac action in persons who have weak and flabby hearts. To avoid these risks it is most important, in the first place, not to have recourse to morphine injections except in cases of very severe pain, which have resisted other remedies; or to give it, once only, for the immediate relief of the pain and until other remedies can be made to act. Another caution to be observed is to use the smallest dose possible; try $\frac{1}{8}$th or $\frac{1}{6}$th of a grain at first, and if that succeeds do not increase it. Give even a smaller dose than this if there is any weakness of the cardiac muscle (in chronic valvular disease, especially aortic disease, in small doses, morphine often steadies the cardiac action), and combine, in this and in most other cases, a small dose of sulphate of atropine with the morphine. It is best to use the hypodermic tabloids now so generally prepared, and to dissolve them in distilled water or water that has been boiled, and to see that the syringe employed is quite aseptic. Tabloids of the following strength can be obtained: Morphine $\frac{1}{12}$ grain, and atropine $\frac{1}{250}$ grain; morphine $\frac{1}{8}$ grain, and atropine $\frac{1}{200}$ grain; morphine $\frac{1}{6}$ grain, and atropine $\frac{1}{180}$. These are the most convenient strengths, as two can be used if larger doses are needed. It does not matter as a rule where the injection is made. In some cases, however, injection over the seat of pain seems to be the more efficacious. The pain once relieved, in some cases it does not return; and we should be particularly careful not to allow any urging on the part of the patient to induce us to inject morphine as a precautionary measure. In some cases it has been found necessary, in order to satisfy the patient, to make an injection of *distilled water* only, and frequently it has been found to answer well.

Local frictions with opium liniment, combined with moist heat, will relieve some of the slighter and more diffused neuralgic pains.

We have already referred to the use of *atropine* combined with morphine; it undoubtedly increases the efficiency of the latter. *Belladonna* has also been used internally for the relief of neuralgia. Formulæ for its administration will be found at the end of the chapter: the liniment is a useful external application for the milder forms, and may be applied mixed with an equal part of chloroform liniment.

Aconite and aconitine are also anti-neuralgic remedies, which are used both internally and externally. They are of chief value in trigeminal neuralgias. Duquesnil's crystalline aconitine in doses of $\frac{1}{250}$ to $\frac{1}{100}$ grain may be given until it causes slight tingling or numbness of the face and lips. The ointment of aconitine or the aconite liniment may also be rubbed in along the course of the painful nerve.

Veratrine in solution in oleic acid (2 per cent.) rubbed in along the painful nerve will often allay the pain, at any rate for a time.

Cannabis indica is an old and favourite remedy with many for facial neuralgia.

Menthol has been given *internally* in neuralgia, but of its usefulness thus administered we have no experience. Applied externally, however, it is of great service in allaying mild forms of neuralgic pain.

A liniment composed of menthol 8 parts, chloroform 4 parts, and olive oil 10 parts, is a useful mode of applying it, or an ethereal solution (1 in 10) may be painted on with a brush.

Chloral is of little use internally for the relief of neuralgia; it may, however, be usefully given to assist in procuring sleep, combined with an equal quantity of bromide of sodium, in certain obstinate cases, but it has but little influence over the *pain*. The liquid formed by rubbing together equal parts of chloral and camphor we have, however, found of great service when applied externally in cases of symptomatic neuralgia, and perhaps a better mixture for the purpose is made by rubbing together 3 parts each of chloral and camphor with 1 part of menthol.

Croton-chloral or *butyl-chloral hydrate* is one of the most reliable remedies in the treatment of facial neuralgia. We were among the first to call attention to the value of this drug in these cases. It may be given in 3-grain doses made into pills with glycerine of tragacanth, or, preferably, in solution, 2 to 5 grains dissolved in a little glycerine (20 minims) and orange-flower water (1 ounce). This dose may be given every hour for 4 doses; if by that time it has had no effect it may be set aside as unsuitable for the case in hand.

We have already alluded incidentally to the use of *chloroform* externally for the relief of neuralgic pain; but it is rarely used alone for this purpose, being usually advantageously combined with other narcotics. Nor is it often used as an inhalation in these cases, although it would be quite justifiable to do so in extremely violent attacks of pain, in order to gain time for the employment of other remedies, or in case of their failure. It is to its use in the form of *hypodermic injections* that we now wish to refer. It has given excellent results in the hands of Bartholow, Besnier, Dujardin-Beaumetz, and others. Five to ten minims or more may be injected *deeply* over the painful points; for this purpose a long stout needle should be used, and thrust down perpendicularly as far as it will go; it is therefore in sciatica that this method is chiefly applicable.

Gelsemium, the yellow jasmine imported from Virginia, and its alkaloid *gelsemine*, have been largely used in the treatment of dental and facial neuralgia. Dr. Wharton Sinkler and other American writers regard it as a remedy of "distinct potency" in those forms dependent on dental caries. They, however, admit the variability in activity of its preparations, and counsel small doses, gradually increased, in order to avoid its toxic effects. "It is well to keep the patient under the influence of the drug for some days—just on the verge of the extreme dose, so that a slight dizziness or dimness of vision is felt for a time after taking a dose of the remedy."* We consider half a grain of the extract or 5 minims of the tincture are safe and suitable doses to begin with, and such small doses may be given every six hours, or more frequently, until some remedial effect is produced. When we have satisfied ourselves as to the strength of the preparation used, and the susceptibility of the patient, larger doses may be given. We have ourselves obtained the best results from a combination of butyl-chloral and tincture of gelsemium, 3 to 5 grains of the former and 5 to 10 minims of the latter, given in a little glycerine and aromatic water.

We must next consider the use of the so-called **antithermic analgesic** drugs, so largely used of late years in the treatment of neuralgia. The chief of these are *antipyrin*, *pyramidon*, *phenacetin*, and *exalgine*.

The pain-relieving properties of **antipyrin** (phenazonum) have been utilised, with some effect, in the treatment of neuralgia, especially in trigeminal neuralgia. A dose of 15 grains may be given at the onset of the paroxysm, and the effect maintained by 5-grain doses every two or three hours, if necessary. As a rule, if no effect is made on the pain after the first thirty grains, it will be of little use continuing to give it. It may be given in the tabloid form or in cachets, but when it is desirable to get a rapid effect it is best given in solution. A mixture may be made containing 60 grains of antipyrin dissolved in 1½ ounce of peppermint water, to which 30 minims of spirits of chloroform should be added; 3 teaspoonfuls will contain the full dose of 15 grains, and a teaspoonful the subsequent smaller dose of 5 grains. It has been used hypodermically, 10 grains dissolved in 20 minims of water, in obstinate forms of sciatica; it should be injected deeply, and then the addition of $\frac{1}{10}$th of a grain of cocaine to each injection is calculated to render it painless.

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* Hare's "System of Practical Therapeutics" (second edition), vol. ii., p. 589.

Pyramidon, a derivative of antipyrin, has been recently introduced as a remedy for neuralgia, and Oppenheim* states that he has "several times seen good results from this drug in severe chronic cases," in doses of 3 to 10 grains.

Phenacetin is a safe analgesic, and may be given in 3- to 5-grain doses every hour, until relief is obtained; if, however, after three or four doses, no effect is produced, it will be useless to continue it.

Exalgine is a valuable addition to our anti-neuralgic remedies. It is soluble in weak alcoholic solutions and less so in water, and a convenient method of giving it is to dissolve 24 grains in 2 drams of rectified spirit, and to add this to 3 ounces of a mixture of some aromatic water and syrup. One or two teaspoonfuls may be given every hour for six doses. Larger doses than this may be needed in some cases, but the effects of the larger doses should be carefully watched, as toxic symptoms have been produced by too large ones. It may be given also in 1- or 2-grain pills made up with gum and sugar, or it can be had in chocolate tabloids.

Cocaine, in strong solution, has been injected along the course of the painful nerve with success in doses of $\frac{1}{4}$ of a grain to a grain; but some consider it an *unsafe* remedy.

The injection of solutions of *osmic acid* (1·5 per cent.) into the affected nerves, or their branches, has been strongly commended by Bennett † and others. A small incision is made over the affected nerve, which is then hooked up and fixed. The needle of the hypodermic syringe is passed along the substance of the nerve as far as it will go. The total amount injected (5 to 10 minims) should be injected at two or three separate injections, so that the nerve may be, as much as possible, soaked in the solution; while the escape of fluid from the wound is prevented by holding a pledget of sterilised wool firmly round the needle where it enters the incision. The solution blackens the soft tissues. Bennett thinks this a most successful method of treatment.

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* "Diseases of the Nervous System" (Mayer's translation), p. 350.

† *Lancet*, Nov. 4th, 1899.

There are still other drugs to be considered, which possess a certain reputation in the treatment of neuralgia, though their mode of action is not known. *Phosphorus* is the chief of these. The French method of giving it dissolved in oil in capsules, each capsule containing 1 milligramme ($\frac{1}{60}$ grain), is a convenient and pleasant form for its administration; from 3 to 10 capsules are given daily. It has proved serviceable in some cases following brain exhaustion and overwork, and Gowers relates a case of trigeminal neuralgia of thirteen months' duration that was cured after three months' treatment with phosphorus; but many physicians look upon the protracted administration of this drug with some alarm, on account of the degenerative changes it is apt to induce. Phosphide of zinc may be used instead of phosphorus, and can be conveniently prescribed in pills containing $\frac{1}{12}$ to $\frac{1}{4}$ grain. The *valerianate of zinc* has been found useful in the same type of case as phosphorus, and we have ourselves found the pill now commonly made of 1 grain of valerianate of zinc and $\frac{1}{60}$ grain of phosphorus of much value in the treatment of hypochrondriacal cases with slight neuralgic pains.

Ammonium chloride is another drug that has been much lauded for its so-called specific effect in curing certain forms of neuralgia. It is given in solution in doses of 20 or 30 grains every four hours. It may be tried when other remedies fail, for it is difficult to say in what cases it may or may not succeed.

Neuralgia of the fifth nerve, or *trigeminal* neuralgia, is perhaps the most frequent form of neuralgia which is encountered in Great Britain. This is readily understood when we consider the number of branches of this nerve, the importance of its functions and relations, and its exposed situation. One or all of its branches may be affected.

The *supra-orbital* branch seems to be affected most frequently. The pain, which is most severe at the supra-orbital notch, spreads upwards and backwards as far as the parietal bone. Painful points have been found just above the notch, at one part of the upper lid, at the emergence of the nasal branch, at a spot over the parietal bone about 3 inches above the ear, and sometimes apparently one in the eye-ball.

The *infra-orbital* branch is not often affected alone, but pain in it generally accompanies pain in the other branches. Pain in the *third division*, in the inferior dental branches, is often associated with dental caries. In all these forms exposure to cold or damp may be the exciting cause.

The more severe and intractable forms of *trigeminal* neuralgia usually come on after middle age. The pain is often agonising, and in not a few instances has driven the sufferer to commit suicide. In the form termed *tic-douloureux*, convulsive twitchings of the facial muscles accompany the attacks of pain. Sometimes the pain comes on quite suddenly with great violence, and lasts only a minute or two. This form was termed by Trousseau "epileptiform." The attacks are apt to recur at very short intervals. The affection of the infra-orbital branch is often associated with migraine. It has been suggested by Dana that this disease depends on an obliterative arteritis of the nutritive vessels of the nerve, since it is apt to occur at the age when such changes begin.

Neuritis undoubtedly exists in many instances.

A less intense and more common form in young people is doubtless frequently dependent on dental affections, and is only amenable to the dentist's intervention.

In the **treatment** of this most painful disease, the principles and observations already laid down must be borne in mind.

In ocular cases errors of refraction must be looked to, and cases associated with exhausted and anæmic states will require careful attention to the nutrition of the patient, iron and arsenic in the intervals between the attacks, and, when practicable, change to a bright, sunny, and bracing climate, which has often succeeded when other means have failed. Large doses of the precipitated subcarbonate of iron have long enjoyed a special reputation for the cure of this disease. Quinine, in full doses, will frequently relieve the periodic forms. Slight attacks are often averted by a glass of port. The following drugs, to which we have already fully referred, all find their applications in the different cases of this disease—some patients being susceptible to the action of one and some to the action of another of them. Butyl-chloral, gelsemium (or these two combined), aconitine, antipyrin, sodium salicylate in rheumatic cases, cannabis indica (pushed up to the point of tolerance); a combination of cannabis indica, arsenic, and quinine; phosphorus; potassium iodide (especially useful if there is any periosteal thickening in inferior dental neuralgia). Cocaine has been instilled into the conjunctival sac, or the nasal mucous membrane has been painted with a 5 to 10 per cent. solution. The inhalation of 3 or 4 drops of amyl nitrite has cut short some attacks. Dana and Sinkler* speak highly of massive doses of strychnine given hypodermically; beginning with $\frac{1}{30}$ grain daily, it is very slowly increased up to $\frac{1}{6}$ or $\frac{1}{4}$ grain. Sinkler says "it often quiets the patient for hours, like a dose of morphine."

Oppenheim calls attention to the fact that purgatives and cold water enemata have occasionally proved curative.*

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* Hare's "System of Practical Therapeutics" (second edition), vol. ii., p. 590.

For *local* application, menthol, camphor-chloral, veratrine, flying blisters, over the points of emergence of the nerves, the actual cautery (which has been found curative applied to the painful point on the side of the tongue in neuralgia of the lingual branch), cocaine injected hypodermically, the methyl chloride spray, and electricity (*static* electricity has proved effectual after galvanism has failed; sparks are drawn from the painful region with the negative pole).

What is known as the *cataphoretic* method has, according to Oppenheim, succeeded in some particularly stubborn cases. *Cataphoresis* is a modification of the ordinary process of osmosis by means of the constant electric current. It has been used with cocaine and with chloroform. The electrode is fitted with a space to contain the drug and attached to the positive pole. It is placed firmly upon the nerve, and a weak current of from ½ to two milli-ampères is used. Oppenheim claims to have obtained "temporary good results" by "energetic irritation of the soles of the feet with the faradic brush." He has not seen much benefit from *nerve-vibration* or from massage of the cervical sympathetic.

The frequent failure of all these remedies to relieve the terrible sufferings of the subjects of persistent trigeminal neuralgia has led to the employment of many surgical expedients to this end. *Excision* of the nerve is generally attended with relief for a variable time, but the neuralgia usually returns. Nerve-stretching and simple division have also been attended with relief of pain for some months. Excision, however, is more certain, and it is well to excise as large a portion of the nerve, and as near the ganglion, as possible. An operation for the removal of the Gasserian ganglion in long-standing and intractable cases of neuralgia of the fifth nerve has been successfully carried out by W. Rose, Keen, Horsley, Krause, and others. Statistics of this operation collected by Krause show that out of 51 patients operated upon 5 died, while the others not only survived the operation, but were cured.* Other operations for the relief of this and other forms of neuralgia have been suggested, such as ligature of the carotid (not to be recommended), and *nerve-extraction* (Thiersch and Wiltel)—the nerve is fastened by a special clamp and by screwing it up pulled out with all its branches. This has produced good results, though not free from remissions. Finally, attempts have been made to cure neuralgia of spinal nerves by division of the sensory roots within the vertebral canal, but whether or not with satisfactory results we are not able, at present, to say.

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* "Diseases of Nervous System," (Mayer's translation), p. 356.

Sciatica.—Perhaps the next most common and most obstinate form of neuralgia we have to treat is that affecting the sciatic nerve. This is most frequently a form of neuritis, or perineuritis, and may be dependent on gout or rheumatism, but it is, no doubt, occasionally an idiopathic neuralgia. It may, in some rare instances, be caused by the pressure of tumours, or of a gravid uterus, or a loaded bowel, on some part of the course of the nerve, and in obscure cases such possible modes of causation should be inquired into; for if, as some have maintained, the pressure of a loaded sigmoid flexure of the colon can cause left-sided sciatica, regular, free evacuation of the bowels would be the first measure needed to bring relief. In many instances it undoubtedly arises from exposure to wet and cold, as lying when heated on damp grass, sitting on a cold stone, etc. Simple muscular over-exertion has been said to produce it.

There is usually more or less pain along the whole course of the nerve, but the most painful points are usually at the notch where it emerges and in the middle of the thigh. Numbness and tingling, and areas of anæsthesia on the back of the thigh and calf, sometimes occur; and in protracted cases the muscles of the affected limb become flabby and wasted.

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* Oppenheim's "Diseases of Nervous System" (Mayer's translation), p. 351.

Occasionally the painful attack comes on suddenly and acutely, but far more commonly the onset is gradual, and the pain is of a wearing, gnawing character.

In some instances sciatica is symptomatic of spinal disease.

The **treatment** of sciatica must be determined by the acuteness or chronicity of the affection.

Acute attacks, of a possibly rheumatic origin, may yield to warm baths, or mustard plasters, and full doses of sodium salicylate; or, if of a gouty nature, to colchicum, with alkaline and saline aperients. A full dose of Dover's powder (12 or 15 grains), in a diaphoretic draught at night, is a very useful remedy in the acute rheumatic forms. Free action of the bowels should always be ensured. In chronic cases, when first seen, we should always try the effect, for a few days, of full doses of potassium iodide; this remedy, even in non-syphilitic cases, will often be found to give complete relief in forty-eight hours. If it fails to have any remedial effects, after three or four days, it may be set aside as unsuitable.

Rest in bed is the greatest auxiliary to all our other treatments. We have already pointed out how valuable counter-irritation is in these cases. Dry cups over the course of the nerve are also useful. Hypodermic injections, in the manner already described, of morphine and atropine (when the pain is intense), of cocaine (⅛th or ¼ of a grain), of antipyrin, of simple water, and of the other agents previously referred to, may all, in turns, be tried in obstinate cases. Hypodermic injections of *osmic acid* have been employed in many obstinate cases, with success. Fifteen minims of a 1 per cent. solution are mixed with enough distilled water to fill a large hypodermic syringe, and this is injected deeply into the nerve in six to twelve places between the ilium and the heel, introducing 1 to 2 minims at each insertion. It is obvious that this combines the treatment by acupuncture with that by osmic acid.

We have already referred to the use of the thermo-cautery and to electricity. Oppenheim* considers the cautery the "best remedy in old and severe cases." Massage, together with galvanism and prolonged and systematic movements of the leg, by which the nerve may be stretched without operation, has also been found of the greatest use in very chronic cases. It may be needful to continue this treatment for many months to ensure a cure.

The external application of *sulphur*, recently so strongly recommended by some American writers, is the revival of an old remedy. The whole leg is enveloped in powdered sulphur, which is kept in contact with the skin during the night by a flannel bandage. One or two such applications have been reported as curing severe sciaticas.

The use of *methylene blue* in the treatment of sciatica has been well spoken of by Klemperer and others. He gave it in doses of about 7 grains in *capsules*—3 to 6 daily. In these large doses it is apt to cause gastric and bladder irritation, which detracts much from its analgesic properties. It would be better to begin with smaller doses, 1 to 3 grains, and gradually increase the dose if the drug is well borne. Some pains should be taken to ensure the *purity* of the drug, as impure specimens are apt to be followed by toxic symptoms. The drug first causes numbness, and this passes gradually into analgesia. Its action is temporary, so that the continuance of the remedy is needful. The patient should be warned that it imparts a blue colour to the urine.

Treatment of sciatica by *absolute rest* in bed has been warmly advocated by Weir-Mitchell. The patient is not allowed to get out of bed for any purpose whatever. He is fitted with a long splint, padded and fixed by bandages, stretching from the axilla to the heel. It is made with a joint at the knee, so that the leg may be slightly flexed, and the angle is changed at each renewal of the dressings. After a few days, passive movements, to avoid stiffness, are made at the daily change of splint. The ankle is supported with a small pillow or pad, in order that the weight of the leg shall not fall on the heel. In chronic cases dry cold is also applied by means of Chapman's ice-bags along the course of the nerve, kept on day and night for many days. If, after two or three weeks of this treatment, a cure is not effected, Paquelin's cautery is applied along the course of the nerve, and, after the healing of the blisters, gentle massage is used. "The massage should be applied with great care, lightly rubbing the surface and stroking the limb in a downward direction."

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* "Diseases of the Nervous System" (Mayer's translation), p. 348.

Many chronic forms of sciatica, especially when of gouty and rheumatic origin, obtain benefit from treatment at **thermal spas** at home or abroad. In all of these, nowadays, some kind of *massage* forms an indispensable part of the treatment. Bath, Buxton, Droitwich, Harrogate, are especially frequented in England; and Aix-les-Bains, Teplitz, Gastein, Baden-Baden, Ragatz, Wildbad, Wiesbaden, on the Continent. Mud baths and hot sand baths have been found useful, and especially the Scotch douche.

Massage is of great service in the treatment of chronic forms of sciatica, and especially in rheumatic and gouty forms. It should be gentle at first, weak strokings and kneadings, for we must be careful that the irritated nerve is not further irritated by too vigorous massage. It is useful also in old cases in promoting the nutrition of the wasted muscles. In the chronic and intractable forms the application of the method recommended and practised by

Dr. Schreiber at Aussee, of long continuance of passive movements, then active movements and finally massage, has been attended by some excellent results.

We must next refer briefly to the treatment of certain other forms of neuralgia. *Cervico-occipital* neuralgia affecting the posterior branches of the upper cervical nerves and the branches of the great occipital (there is usually a *painful point* midway between the first cervical vertebra and the mastoid process) is best treated by the application of dry heat or Paquelin's cautery; internally antipyrin or phenacetin will usually relieve the suffering, and in periodic cases quinine or arsenic should be given.

Cervico-brachial neuralgia involves the sensory nerves of the brachial plexus. The pain is referred chiefly to the shoulder and along the course of the ulnar nerve. Painful points are likely to be found where the circumflex nerve pierces the deltoid and over the ulnar nerve at the elbow. It is sometimes associated with rheumatism of the deltoid. Sponging or affusion with hot salt and water twice daily, enveloping in cotton wool, and keeping the arm absolutely at rest will prove curative. When more chronic, massage and hot douches are most serviceable. Galvanism, the faradic brush, or static electricity may prove advantageous in obstinate cases. In distinctly rheumatic forms sodium salicylate or salicin should be employed; or potassium iodide and colchicum will often be found more efficacious in gouty constitutions. When the general health is at fault, quinine, iron, and cod-liver oil may be needed. Treatment at a thermal spa frequently proves rapidly beneficial in this form.

Intercostal neuralgia is of rather frequent occurrence, especially in anæmic and hysterical women. *Herpes zoster* or *shingles* often accompanies or precedes intercostal neuralgia. This form is no doubt commonly a neuritis. The pain attending the herpetic eruption may be allayed by painting it over with a solution of cocaine or applying a cocaine or morphine ointment, or sometimes a lead lotion allays best the cutaneous irritation. Antipyrin or phenacetin may be given internally. Sinkler says: "The application of a 1 per cent. solution of cocaine in unguentum petrolatum is said to be an infallible and rapid cure of zoster."* If the affection becomes chronic, counter-irritation over the points of exit of the corresponding spinal nerves (either a blister or iodine paint) should be applied. Hydrotherapy, and especially the use of alternate hot and cold jets (the Scotch douche), may be tried, and often with advantage. In anæmic cases, the warm chalybeate baths, and the internal use of the iron waters of Schwalbach, Spa, or some similar spring are indicated. In rheumatic cases salicin and the salicylates, or potassium iodide, may advantageously be given.

Coccygodynia often proves a very intractable form of neuralgia, and removal of the coccyx has occasionally been resorted to for its relief. Electrical treatment has, however, been said to cure many cases. Sinkler mentions a severe case which was cured by always sitting on a chair which had a large hole in the seat.

Lumbar, or *lumbo-abdominal*, neuralgia differs from lumbago in radiating in various directions and not causing so much pain on movement. Frictions with stimulating and sedative liniments, such as the aconite and chloroform liniments mixed, belladonna liniment (or hypodermic injection of atropine), sodium salicylate in full doses or actea in rheumatic forms, and antipyrin have all been used with advantage.

Plantar neuralgias, painful affections of the sole of the foot, are usually most intractable and difficult to treat. Sometimes the avoidance of any pressure on the foot and going barefooted will give relief; on the other hand, we have seen instances in which firmly bandaging the instep and front of the foot was of immediate benefit. Oleate of morphine and atropine have been applied to relieve the cutaneous sensitiveness. Dujardin-Beaumetz found sulphur foot-baths and the application of a strong tincture of iodine useful. We have injected full doses of atropine into the dorsum of the foot with advantage.

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* Hare's "System of Practical Therapeutics" (second edition), vol. ii., p. 601.

To discuss all the remedies that have been advocated for the treatment of all the various forms of neuralgia would be an endless task; we have endeavoured in the general remarks at the beginning of this chapter, and in the special references at the end, to give as full an account as practicable of the most useful measures to employ, and in the additional formulæ will be found some other useful details for reference.

NEURITIS, LOCALISED AND MULTIPLE.

We have already alluded to the fact that certain forms of neuralgia are due to neuritis, or perineuritis, and especially neuralgia of the sciatic nerve. We must now consider the subject of **neuritis** in a more general and wider sense—as a disease appearing in a variety of forms, and giving rise to a series of important symptoms, the nature and origin of which it is important to recognise, in order that we may be enabled to administer effectually to their relief.

For our present purpose it will be sufficient to consider this subject under *two* divisions—(1) *localised neuritis*, or neuritis affecting any nerve, or part of a nerve, or group of nerves; and (2) *multiple neuritis*, in which affection many or nearly all the nerves in the body may be at the same time affected. Either form may be acute, sub-acute, or chronic, and the symptomatic phenomena, and doubtless also the underlying physical changes, may assume very various degrees of intensity.

First with regard to **localised neuritis.** The most frequent causes of this affection are—(*a*) exposure to cold; (*b*) local injury from wounds, pressure, etc.; (*c*) the extension of inflammation from adjacent parts. Rheumatism, gout, diabetes, and syphilis may be also mentioned as causes.

The characteristic *symptoms* of the acute or sub-acute forms are—pain of an aching, burning, or boring nature along the course of the nerve affected and its branches; great sensitiveness and tenderness on pressure over the nerve trunk and its terminations; perverted sensation in the area of its distribution, such as burning, pricking, tingling, numbness, etc. Sometimes a more diffused sensitiveness and exquisite tenderness may be observed over a wide area of the cutaneous surface. Increased perspiration, effusion into joints, physical changes in the skin and sub-cutaneous tissues (redness, swelling, œdema, "glossy skin," herpes, and other eruptions), and occasionally local spasmodic phenomena may occur. In some acute cases the trunk of the nerve affected can be felt to be swollen. In chronic cases, when more or less degeneration of the nerves affected has taken place, we may encounter, as well as diminution or loss of sensation, a loss of motor power, in proportion to the extent of involvement of motor nerves. Muscular atrophy is common.

The clinical features of each case will necessarily depend on the localisation and intensity of the neuritis. If limited to the peripheral terminations of a nerve the symptoms may be mild; but if the affection diffuses itself through a whole limb or limbs, or extends to nerves, like the vagus, of vital importance, the case may assume the most grave and serious aspect. Any nerve in the body may be affected by neuritis, but we may here refer to two or three special forms on account of their frequency and importance.

Facial, oculo-motor, and other local paralyses are usually, at their commencement, instances of neuritis.

Facial or Bell's *paralysis* is usually a rheumatic neuritis from exposure to chill, or it may be due to local injury, or to syphilis, or it may be dependent on otitis. If of rheumatic origin, and the case is seen, as it usually is, in the *acute* stage, a leech or two should be applied over the seat of emergence of the nerve; or a blister is preferred by some, and salicin, or sodium salicylate, or potassium bicarbonate should be given internally. A dose or two of calomel may also be given at first, followed by a saline aperient. The continuous local application of moist or dry heat is of service, together with rest and confinement to a warm apartment. As soon as the acute symptoms have subsided, small or moderate doses of potassium iodide are appropriate. Later on, to restore muscular tone, electricity should be applied, and such tonics given as strychnine, quinine, and iron. Strychnine has been injected locally over the site of the nerve with advantage. If there is reason to believe the affection to depend on syphilis (in that case the auditory nerve is likely to be also involved), large doses of potassium iodide and free mercurial inunction, or hypodermic injections of corrosive sublimate, should be employed.

Oculo-motor (third nerve) paralysis is usually due to syphilis, especially when it is total. If only the external branches are involved, there is more chance of its being rheumatic. The preceding general therapeutic directions apply to this and to other forms of localised peripheral paralysis.

Brachial neuritis of a very severe form, arising in connection with diabetes, has been found to yield to large doses of sodium salicylate, the hypodermic injection of morphine and atropine twice daily, and complete rest.*

Gowers considers that mercury exerts a distinctly curative influence over neuritis, and recommends a grain of blue pill twice a day in these cases.

We have already referred to the fact that most cases of *sciatica* are of the nature of a neuritis. Hence we have pointed out the value of rest, of the local application of cold and of anodyne remedies during the acute stage, and of potassium iodide, massage, and electricity in the chronic stage. In the latter stage Deaver and Mills have called attention to the value of **operation.** "By opening the sheath and breaking up any adhesions that may be present" the nerve is given a better chance of repair; "or, when degenerated, by disturbing the molecular condition of the nerve and stimulating it to take on regenerative action; or, again, in those cases of chronic inflammation of a nerve in which physiological movements never allow it to be sufficiently long at rest to accomplish a cure, by removing a section of the inflamed nerve and thus getting rid of the constant irritation,"* a cure may be effected.

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* Professor C. K. Mills: Hare's "System of Practical Therapeutics" (second edition), vol. ii., p. 741.

We may thus summarise the general **treatment** appropriate to these cases, according to the stage of the disease, noting at the same time that the treatment suitable to the acute and sub-acute stages might prove injurious in the chronic stage, and *vice versâ*:—In the *acute* stage, complete rest, with leeches, cupping, mercurials, salicylates; in the *sub-acute* stage, rest, gentle massage, sodium salicylate, phenacetin, quinine; in the *chronic* stage, electricity, strong galvanic or faradic currents, massage, Swedish movements, suitable gymnastics, mineral baths.

Secondly, as to **multiple neuritis.** This is a form of neuritis which is usually excited by toxic or infective agents. It is said, in its *acute* form, to follow exposure to cold or over-exertion, or to occur spontaneously; but it is possible, in such instances, that some other determining factor may have been overlooked. The abuse of *alcohol* is one of the most common causes, and the alcoholic form is the one we shall most frequently encounter clinically. Of the many other poisons that may cause multiple neuritis the following may be enumerated:—Lead, arsenic, ergot, carbonic oxide; the toxic substances that accumulate in the tissues in jaundice, uræmia, rheumatism, gout, diabetes; and the infections of diphtheria, scarlet fever, variola, typhoid, influenza, tuberculosis, syphilis, and other infective maladies. Much excitement has been caused in this country recently by the wide-spread outbreak of arsenical neuritis from the consumption of contaminated beer in certain districts.* It has been pointed out that this disease is especially prone to occur when a person already under the influence of one toxic agent is attacked by another, as alcohol plus arsenic, or lead plus alcohol, or alcohol plus influenza, and so on.

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* *Journal of Nervous and Mental Diseases*, Dec., 1890.

The *symptoms* of this widely spread inflammation of the nerves are most various and complex, and not unfrequently vague and indefinite. It is the exception rather than the rule to encounter the definite and decided symptoms described in text-books. As Prof. Starr† observes: "Numerous cases of indefinite nervous symptoms, pain of various kinds, formications and odd sensations, grouped under the indefinite terms—numbness, flushes of cold and heat, accompanied by actual changes in the temperature of the part, or only by apparent vascular irregularities—slight spasms or tremors—functional weakness with sense of fatigue, not reaching the grade of paresis, and many equally obscure manifestations of disturbed function in various parts of the body, receive their best explanation in the theory of multiple neuritis." Some cases are exceedingly acute and severe (*acute febrile polyneuritis*); they commence with rigors and fever (temperature, 103° to 104°), and the general symptoms of an acute infection. The more characteristic phenomena are intense pain in the nerves —not, however, constant—tingling and formication in fingers and toes; loss of muscular power, beginning in legs or arms and extending to the trunk (*ascending* paralysis); rapid wasting of muscles. In some cases the sensory disturbances are slight. The course is sometimes rapid, and the patient may die, within a week or ten days, from paralysis of the respiratory muscles, or from cardiac asthenia. In less severe cases, after a few weeks of a stationary condition, gradual improvement sets in, and after, perhaps, a year or more of partial paralysis, contractures, etc., complete recovery ensues.

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* For a full account of this epidemic, the reader is referred to the *Encyclopædia Medica*, vol. viii., p. 301.

† The Middleton-Goldsmith Lectures, *Medical News*, Jan. 7th, 1887.

The **alcoholic** form is the most common. It occurs especially in women addicted to the secret, constant habit of spirit drinking. The onset is usually gradual, and the nature of the case often obscure; the pains and tingling of the feet and hands and tenderness of the muscles are often referred to rheumatism and neuralgia. The various degrees of loss of power usually begin in the feet and legs and extend to the hands and arms. The degree and extent of the muscular paralysis is very variable. The disturbances of sensation are also very variable in their degree, from mere numbness and tingling to severe burning and boring pains, great tenderness over the nerve-trunks, and soreness of the muscles when grasped. The hands and feet, when dependent, usually become congested and puffy. The feet and toes and the wrists and fingers are often "dropped," from loss of power of the extensor muscles. The deep reflexes are lost.

Mental symptoms, hallucinations, and delirium are not infrequent in severe forms.

The prognosis is, as a rule, favourable; and, under suitable and protracted treatment, the muscles regain their power, and recovery is established.

Beri-beri is an endemic neuritis peculiar to certain parts of India, China, and Japan.

The **treatment** appropriate to these cases must vary according to their acuteness and severity. The *relief of pain*, which is often very severe in the acute forms, is the first indication. Absolute rest in a *comfortable* bed is essential. In alcoholic cases the alcohol should be wholly suppressed, and a nourishing light diet of milk, eggs, soups, light puddings, fish, pounded chicken, etc., should be prescribed. An abundance of fatty food, including cod-liver oil, is thought to be especially advantageous. Protracted warm baths are usually particularly soothing and grateful to the patient. Some recommend "rapidly alternating applications" to the limbs of very hot and very cold water. "A large sponge or soft towel is dipped first in very hot, and another in very cold water, and one is made to follow the other rapidly up and down the limb. If used properly, this makes an agreeable and useful method of local sedation or counter-irritation." Opium, in some form, must also be given to relieve the pain; the best is morphine ($\frac{1}{6}$ grain) and atropine ($\frac{1}{120}$ grain) in hypodermic injections twice or thrice daily. Some prefer antipyrin, phenacetin, and their congeners, but these drugs fail to calm the nervous system to the same extent, and they all are, more or less, cardiac depressants. For the same reason we think cocaine should be avoided. General debility or cardiac asthenia may call for cinchona, quinine, strychnine, or digitalis.

Salicin and sodium salicylate certainly relieve the pain in many cases; but their continued use, in quickly repeated and large doses, not unfrequently produces the most serious conditions of cardiac debility. C. K. Mills recommends strongly the *oil of gaultheria* (methyl salicylate), in 10- to 15-minim doses, mixed with one or two tablespoonfuls of almond emulsion, or it may be given in capsules, 10 minims in each. The bromides and hyoscine may be needful in cases with cerebral excitement. *Syphilitic* cases should be treated with mercurial inunction and potassium or sodium iodide. A combination of the latter with sodium bromide has been found useful. Malarial cases require full doses of quinine and arsenic. Lead cases require the alkaline iodides as eliminants. In arsenical cases they are also of service. Hypodermic injections of strychnine have been found valuable. The latter have been particularly commended by Professor Leyden. He considers strychnine of great value in those progressive cases in which the respiratory movements are threatened. By increasing the excitability of the affected muscles it promotes the return of normal function and nutrition. From $\frac{1}{70}$ to $\frac{1}{20}$ grain should be injected twice a day. Warm baths are of great value in most cases. *Massage*, at first of the gentlest kind, may be commenced as soon as the pains and tenderness have, to a great extent, subsided. In sub-acute and chronic cases massage, associated with galvanism, is of the greatest service. Inunctions, anodyne or remedial, may be combined with massage, such as weak aconitine ointment, mixed mercurial and belladonna ointments, or other suitable external applications. Swedish movements may, as the case progresses towards recovery, be added to massage. Electricity should be applied tentatively at first, and very weak currents used, and it should be discontinued for a time if the patient seems to be made worse by it. Some think it important, when the patient is in bed, in order to prevent the tendency to deformity, to use sand bags to keep the feet at right angles to the legs, and to take pains to keep the legs extended as much as possible.

ADDITIONAL FORMULÆ.

Hypodermic injection of antipyrin for neuralgia.

℞ Antipyrin, gr. lxxv.
Aquæ destillatæ, ℥ijss.
M. f. injectio. A syringeful to be injected several times a day. (*Dujardin-Beaumetz.*)

For trigeminal neuralgia.

℞ Veratrinæ, gr. iv.
Alcohol, ♏vj.
Adepis benzoati, gr. xcvj.
M. f. ung. "Veratrine ointment." (*Bartholow.*)

For Sciatica.

℞ Extracti belladonnæ, gr. ijss.
Extracti stramonii, gr. iij.
Extracti cannabis indicæ, gr. vj.
Extracti aconiti, gr. ij.
Extracti opii, gr. xij.
Extracti hyoscyami, gr. x.
Extracti conii, gr. x.
Pulveris extracti glycyrrhizæ, q.s.
Ut f. pil. xxiv. Two to five pills daily. (*Brown-Séquard.*)

Also,

℞ Tincturæ radicis aconiti, ʒj.
Tincturæ seminum colchici, ʒiij.
Tincturæ belladonnæ, ʒiij.
M. f. tinct. Six drops every six hours until relieved.
(*Metcalf.*)

For trigeminal neuralgia.

℞ Butyl-chloral hydrate, ʒj.
Extracti cannabis indicæ, gr. jss.
M. et divide in pil. xij. One every three hours. (*Whitla.*)

For Sciatica.

℞ Spiritus terebinthinæ, ℥ss.
Mellis puri, ℥jss.
M. f. confectio. A teaspoonful night and morning.
(*Bamberger.*)

For trigeminal neuralgia.

℞ Liquoris arsenicalis, ℥ss.
Aquæ destillatæ, ℥ss.
M. Five drops three times a day. (*Prof. Albert.*)

For dental neuralgia.

℞ Tincturæ opii, ʒss.
Chloroformi, ʒss.
Creasoti puri, ʒss.
Tincturæ benzoini compositæ, ʒj.
M. f. tinct. To be applied to the cavity of the tooth on cotton-wool. (*Redier.*)

In periodical forms.

℞ Quininæ sulphatis, ʒss.
Sacchari albi, ʒss.
M. et. div. in pulv. vj. One or two to be taken before the expected attack. (*Bamberger.*)

Also,

℞ Gummi asafœtidæ, gr. lxxv.
Extracti rhei, gr. xxx.
Extracti taraxaci, q.s.
Ut f. pil. lx. (To be silvered.) Two pills night and morning.
(*Bamberger.*)

For trigeminal and other forms of neuralgia.

℞ Sodii salicylatis, ʒiij.
Sodii iodidi, ʒj.
Syrupi simplicis, ℥j.
Aquæ ad ℥viij.
M. f. mist. A tablespoonful thrice daily. (*Prof. Benedikt.*)

In supra-orbital neuralgia.

℞ Quininæ sulphatis, gr. v.
Morphinæ hydrochloridi, gr. ⅙.
Ammonii chloridi, gr. xv.
M. f. pulv. A powder, wrapped up in moistened wafer paper, to be taken every six hours, after food. (*Whitla.*)

For facial neuralgia.

℞ Butyl-chloral, gr. xv.
Glycerini, ℥j.
Syrupi simplicis, ʒvj.
Spiritus menthæ piperitæ, guttæ iij.
Aquæ ad ℥iv.
M. f. mist. A tablespoonful every two hours. (*Worms.*)

Hypodermic injection of ergotin for facial neuralgia.

℞ Ergotini, ʒss.
Aquæ laurocerasi, ʒijss.
Glycerini, ʒijss.
M. f. injectio. Twenty minims for a dose. (*Marino.*)

For hysterical neuralgias, especially of the face.

℞ Extracti gelsemii, gr. v.
Quininæ valerianatis, ʒss.
Zinci valerianatis, ʒss.
Ferri valerianatis, ʒss.
M. et divide in pil. xx. One thrice daily, after food.
(*Whitla.*)

For sciatica and crural neuralgia.

℞ Veratrinæ, gr. xx.
Vaselini, ℥j.
M. f. ung. To be rubbed in every other day.
(*Prof. Albert.*)

For intercostal neuralgia.

℞ Chloroformi, ʒvj.
Olei olivæ, ʒvj.
M. f. linim. For external application. (*Bamberger.*)

Also.

℞ Veratrinæ, gr. iij.
Morphinæ hydrochloridi, gr. iij.
"Cold cream," ʒijss.
M. f. ung. A piece the size of a pea to be rubbed in over the painful nerve. (*Bamberger.*)

For subcutaneous injection in trigeminal neuralgia.

℞ Cocainæ, gr. iss.
Morphinæ sulphatis, gr. ¼.
Sodii chloridi, gr. ivss.
Aquæ ad ℥iij.
M. f. solut. (*Schleich.*)

For recent rheumatic neuralgias (sciatica, etc.).

℞ Phenacetin, gr. xl ad gr. lx.
Salol, gr. xl ad gr. lx.
Caffeinæ, gr. iv ad gr. vj.
Divide into 10 cachets. Take two to four daily. (*Domanski.*)

In rheumatic neuralgias.

℞ Salophen, gr. xij. ad gr. xl.
In cachets. Three to five cachets to be taken daily. (*E. Koch.*)

Aconitine application for neuralgia.

℞ Aconitinæ, gr. v
Acidi oleici, ʒiv
Olei lavand., ♏v.
M. f. oleatum. To be painted along the affected nerve.

CHAPTER IV.

THE TREATMENT OF MIGRAINE AND OTHER HEADACHES; AND OF INSOMNIA.

Migraine and other Headaches — *Migraine* or *Hemicrania* — Paroxysmal Character — Premonitory Symptoms — Visual Disturbances—Course of the Attacks—Treatment—In the Intervals — In the Paroxysms — *Anæmic Headache* — Its Characters — Its Treatment — *Neurasthenic Headache* — *Congestive Headache*—Indications for Treatment— *Toxæmic Headache*—*Sympathetic or Reflex Headache.*

Insomnia — Its Causes — Physical and Mental — Treatment of Different Forms — Various Hypnotic Agents. Additional Formulæ:

MIGRAINE AND OTHER HEADACHES.

DISCOMFORT about the head, or **headache,** of greater or less intensity, occurs in the course of most acute febrile diseases and in diseases attended with blood contamination, as in renal and other disease. Pain in the head also occurs, of necessity, in certain diseases of the bones of the skull or its coverings, as in syphilis and rheumatism, and also in certain diseases within the cranium, as inflammation of the brain and its membranes, tumour, abscess, etc. But headache, as a necessary symptom of diseases such as these, forms part of the clinical characters of these affections themselves, and cannot well be considered apart from them therapeutically. It is needful, however, to point out that the existence of severe and *persistent* headache should always suggest the possible presence of serious intracranial disease, or disease of the cranial bones or coverings, and especially such as may be of a syphilitic nature. It is extremely important not to overlook cerebral syphilis as a possible cause of headache, as the adequate application of specific antisyphilitic treatment will often rapidly dissipate symptoms of the most serious aspect. The co-existence of a localised paralysis, especially of the third nerve, will often disclose the syphilitic nature of severe and persistent headache.

But the headaches we are now about to consider are usually independent of the existence of acute or structural disease, and are mostly of temporary duration. The subject is a very complex one. We shall, therefore, for the sake of clearness, begin by considering the most characteristic of these—viz. *migraine* headaches—and afterwards pass on to examine the mode of origin and treatment of other forms of this troublesome affection.

Megrim, **migraine**, or *hemicrania* is distinctly paroxysmal in its character. The attacks frequently recur at intervals of about three weeks or a month; in women the attacks have often been observed to occur about the menstrual period; but they may occur more frequently, even once or twice a week. Indiscretion in diet, working in over-heated rooms, emotional excitement, overwork or worry, long railway journeys, or other disturbance or exhaustion of the system, will often determine the occurrence of an attack in the predisposed. Some warning of the attack is frequently felt, for a day or two before, in the shape of general depression, and slight headache or feeling of fulness in the head on getting up in the morning; or some dyspeptic symptoms may occur. In one of our own patients the attack is always ushered in by the passage of urine loaded with phosphates, and as the attack passes off the phosphates disappear and the urine throws down lithates abundantly. The disappearance of the phosphates and the appearance of lithates in the urine is always a sign that the attack is passing off. Some patients feel cold and chilly before an attack. In many the attacks not unfrequently commence with disturbances of *vision* (*ophthalmic migraine*). Bright spots of light, luminous zigzags or "fortifications," luminous scintillating circles, like " wheels of fireworks," and various other appearances, are described by different patients. Seeing only the half of things, hemiopia or hemianopsia, is not very uncommon, but more frequently there is merely a blurring of objects, the outlines of which appear indistinct. Curious visual hallucinations occasionally occur, and images of persons or animals are distinctly seen.

Severe pain, usually but not invariably confined to *one-half* the head, follows these premonitory symptoms. We have seen cases in which the ocular symptoms have alone occurred, followed simply by a slight feeling of fulness in the head. The face, pale at first, subsequently becomes flushed, and there is generally a complaint of nausea. In some instances the face remains pale. Light and noise are especially intolerable, and the patients naturally seek repose and quiet in a darkened room. Tingling and pricking are sometimes noticed in the fingers or hand and arm, and we have seen patients in whom the attack has commenced with tingling and pricking in the lips and tongue. Numbness of the right arm and leg, with temporary aphasia, has been observed to precede some attacks. The pain in the head is then on the *left* side. These disturbances of sensation do not, as a rule, last more than fifteen to twenty minutes. Curious coincident mental conditions have also been described, a sort of transitory insanity, excitement, confusion, or stupor, associated with hallucinations.*

The pain in the head is often excessively severe, and the nausea we have already referred to often ends in vomiting; hence the term "sick-headache." In some cases the vomiting is very distressing and aggravates the headache, but in many, after the vomiting, the headache begins to abate, the patient breaks into a perspiration, falls asleep, and awakes well. As a rule, the attack does not last more than twenty-four hours, and after a night's rest it passes away; but the severe forms sometimes last for two or three days.*

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* Sinkler: Hare's "System of Practical Therapeutics" (second edition), vol. ii., p. 569.

It is customary to say that the patients feel unusually well after an attack, but that is by no means always the case, and we have had occasion to observe much nervous shock, in neurotic subjects, after an attack, and particularly in those attacks in which there has been little or no headache, but only the sensory disturbances described.

This disease is frequently hereditary, especially in neuropathic families. It has been stated that direct heredity can be proved in 90 per cent. of the cases. It is also observed especially in the gouty.

The analogy this disease bears to epilepsy can hardly be overlooked; in both, the attacks are paroxysmal, with *auræ* preceding the attack and sleep ending it. There can be little doubt that there is some pathological relation between them.

The theory of *vascular spasm* is the one which seems most consistent with the phenomena of this disease, the spasm originating in some toxic condition of the blood acting upon a hyperæsthetic nervous area. This would account for the cerebral symptoms which precede the attacks of pain, and in some instances occur without the headache. Other vasomotor disturbances observed are probably the *effect* of the pain. The face is sometimes *flushed* and sometimes *pale*—or pale at first and subsequently flushed. It has also been noted that the temporal artery is sometimes dilated, and that its compression relieves the pain;† compression of the carotid has also been said to relieve the pain in some cases. May it not be that there is at first arterial spasm and partial cerebral anæmia, and that a *collateral* hyperæmia is chiefly concerned in causing the headache? For the source of the toxin we must probably look to defects in secreting and excreting functions, hepatic or other inadequacy, absorption of toxins originating in the alimentary canal, and which normally would be excreted. In this we see the relationship to gout.

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* Oppenheim has called attention to certain cases occurring in *neurasthenic* or *hysteric* persons, in whom, after they have suffered for a long time from *typical* attacks, these attacks become converted into a *permanent* form ("Diseases of Nervous System," p. 753).

† Mackenzie: J. Allbutt's "System of Medicine," vol. viii.

We may offer to the sufferers from this disease the consolation that it often disappears after middle age.

It has also been known to disappear after change of climate, after an attack of fever, and after an injury to the skull; but it is rarely entirely cured by treatment.

The **treatment** of this affection must depend greatly on the constitution and habits of the sufferer; that suitable to a robust gouty patient will not be altogether appropriate to an anæmic and neurotic subject. We will consider *first* the treatment in the intervals, and, *second*, the treatment of the paroxysms.

1. Careful attention to diet and regimen is essential in all cases; but we must not expect too much from this, as many sufferers from migraine are amongst the most abstemious. The gouty subject should avoid all dietetic excesses, and should take merely a sufficiency of the plainest and most digestible forms of food. He should avoid all malt liquors, sweet wines, or, indeed, wines of any kind; and if a stimulant seems needful, a very little sound brandy or whisky, with seltzer or Apollinaris water, should be taken. Regular exercise in the open air is advisable, and all overwork or worry should, if possible, be avoided. Frequent aperients are of great service, as such patients often learn for themselves, promoting as they do the elimination of *toxic* substances upon which the attacks may depend. A pill of aloes and henbane, containing also a grain of blue-pill, at bed-time, and a dose of Carlsbad or Homburg salts in a tumblerful of hot water the following morning, are one of the best *preventives* of these attacks in the gouty.

We have seen gouty cases in which the attacks have been kept off by annual visits to Marienbad.

It is in gouty and rheumatic subjects that a combination of sodium salicylate and sodium bromide answers so well. About 15 grains of each with half a dram of sal volatile should be given at night during the intervals, and night and morning at the period of the attacks. If the sodium salicylate proves depressing, 10 grains of salicin and 10 grains of potassium bicarbonate may be substituted for it.

Oppenheim * maintains that *arsenic* is the drug of most value in this affection. He mentions a case in which the attacks were so severe that the patient threatened suicide, and all remedies proved useless until he prescribed the arsenical water of Levico, which cured him, and he rapidly gained 10 lbs. in weight. Arsenious acid ($\frac{1}{60}$ grain) may be given in a pill, after food, three times a day. The Levico water contains a considerable quantity of sulphate of iron as well as arsenious acid.

Anæmic and neurotic patients will require a nourishing but simple diet, and will be benefited by iron tonics; but they usually require the mildest preparations of iron, such as the ammonia-citrate, which should be combined with an alkali and aromatic spirits of ammonia. The arsenate of iron, in pills of $\frac{1}{24}$ grain, after food, three times a day, we have also found useful. A course of iron waters at Schwalbach, Pyrmont, or Spa often proves of great service in these cases, due elimination by the bowels being, at the same time, carefully looked to. The advantages of regular aperients are almost as evident in these as in the gouty cases, and should never be neglected. Bamberger gives quinine in some of these cases, during the intervals, and a full dose of 4 or 5 grains on the onset of the attack. A modified course of *rest treatment* has been warmly commended in anæmic cases by some American physicians. A change of climate has often been found useful in these anæmic forms, such as a prolonged stay in dry, bracing, mountain air in some cases, and in seaside resorts in others, but they should not reside close to the sea. Hydrotherapy, massage, and a rest cure may often be advantageously combined with change of air. A careful use of the bromides has proved, in our hands, very useful in warding off attacks, especially in those cases in which the sensory disturbances are chiefly complained of, and the subsequent headache is but slight. When the period of the return of an attack is well known, it is a good plan to begin giving the mixed bromides, in moderate doses, for three or four days before the attack is expected, and they will often be found to have the effect of greatly modifying its severity. We have found a combination of butyl-chloral (5 to 7 grains) and sodium bromide (10 to 20 grains) of remarkable efficacy in preventing the ocular disturbances.

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* "Diseases of Nervous System," p. 755.

Many physicians are disposed to refer attacks of migraine to errors of refraction, which may be cured by *spectacles.* Glasses are no doubt of great service in some instances, and it is a good rule always to have a special examination of the eyes made for visual defects. But headaches dependent on errors of refraction hardly belong to this very definite class of paroxysmal headaches. For the same reason, cannabis indica, belladonna, and hyoscyamus have been advocated because of the sedative influence they exert on the third nerve and the muscles it supplies, including the iris. Cannabis indica, extolled by many, we have not found a very reliable drug. It is given alone, in doses of $\frac{1}{8}$ of a grain of the extract, cautiously increased; or in combination with arsenic and iron, or, in hyperæmic states, with ergot and nux vomica. It is usually given continuously for many months. Dr. Wharton Sinkler strongly advocates this treatment with cannabis indica. He gives it combined with arsenic and iron, or with digitalis and iron, or with nux vomica and ergotin.*

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* Hare's "System of Practical Therapeutics" (second edition), vol. ii., p. 573. His formulæ will be found, amongst others, at the end of this chapter.

2. *For the attacks* we have found large doses of the bromides of great service, and the combination of butyl-chloral and bromide already mentioned. The latter is of particular service in markedly neurotic subjects. *Antipyrin* and *phenacetin* are also of much efficacy in affording relief in the slighter attacks, and, if given early, in allaying the distress of the severe forms. We do not approve of those large doses of antipyrin prescribed and taken by many. We are satisfied that considerable impairment of cardiac tone follows its free use. Phenacetin we consider less objectionable. This latter drug may be given in cachets in doses of 3 to 10 grains, usefully combined, in many cases, with a few grains of quinine. Antipyrin may be given in 5- to 10-grain doses, taking care that not more than 20 grains are given in a day. We have found caffeine of great service in diminishing the severity of attacks, if taken at the commencement. It may be given in grain doses, mixed with a little sugar of milk, every half hour, till 4 or 5 grains have been taken, or it may be given in larger dose (3 to 5 grains) with potassium bromide.

A drug, named by its introducer (*Oberlach*) *migranin*, has been extolled by Ewald as a remedy in this form of headache. It consists of antipyrin in combination with caffeine and citric acid. The dose is about 16 or 17 grains, to be repeated in half an hour if the pain is not relieved. Oppenheim does not think it "justifies its name." He has seen *pyramidon* do much good.

We have found *guarana* useful in many cases. Sinkler recommends 10 grains of guarana with 5 grains of sodium salicylate to be given every ten or fifteen minutes, until three or four doses have been taken; or 10 grains of sodium salicylate may be combined with a dessertspoonful of effervescing citrate of caffeine. Oppenheim finds a large dose of sodium salicylate (30 to 45 grains) in a cup of strong coffee often successful in the relief of the pain.

Many other drugs have been advised in this malady—and there can be no objection to giving them a trial—such as the hypodermic injection of hyoscyamin ($\frac{1}{80}$ grain); oil of eucalyptus in 5-minim capsules every half-hour for four doses; the fluid extract of ergot in dram doses every hour, if necessary, until three doses have been taken in cases with vascular relaxation, and nitro-glycerine has been found useful in the *angio-spastic* form;* aconitine, $\frac{1}{200}$ of a grain every hour; externally a cold compress may be applied to the head or a mustard plaster to the nape of the neck, and the feet put into a hot footbath. Mr. Walter Whitehead † has stated that he has "never failed to treat successfully the most inveterate and severe cases of migraine by the introduction of an ordinary tape **seton** through the skin at the back of the neck." He has reported several very obstinate cases that have been cured by this means. The seton must be worn uninterruptedly for three months in the first instance, and if the symptoms recur a second seton must be introduced. Most patients find that one of the best remedies is *rest in bed* in a darkened room, and that they can often "sleep off" an attack. Whatever remedies we employ we should insist on rest as an auxiliary during the attacks.

Having considered the treatment of this *special* form of headache we must now return to the subject of headache in a *general* sense.

The successful treatment of headache must, of course, depend on our skill in ascertaining its true cause. The diagnosis of the form we have just been considering is usually easy on account of its very well marked characters, but in other forms it is not always easy to discover their true nature.

The chief influence in the causation of headache has been referred to *variations* in *intracranial* blood pressure due to vaso-motor disturbances, so that we may have headaches due to active hyperæmia and headaches due to anæmia; in the former we get severe throbbing pains in the head, with face flushed and eyes suffused, and often vertigo. Such headaches may be caused by mental strain, emotional excitement, alcoholism, excess of tobacco, etc., or the headache may be dependent on *venous* hyperæmia, as in that of chronic heart disease, pulmonary emphysema, and in continuous cough.

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* Thomson (*Journal of Nervous and Mental Diseases*, Feb., 1894) speaks highly of this remedy.

† *Brit. Med. Journal*, Feb. 9th, 1901, p. 335.

Headache may also attend *anæmia.* In such cases there probably exists a hyperæsthetic condition of the nerves, together with the presence of some toxic substances in the blood due to defective elimination. This brings us to the next somewhat extensive group of cases, viz. those due to *auto-intoxication* or **toxæmic** headaches. This group is a large one, and indeed it is not improbable that auto-intoxication may be a factor in the causation of most cases of headache. As instances of toxæmic headaches we may mention those due to dyspeptic conditions, to constipation, to hepatic and renal inadequacy, to diabetes, to rheumatism and gout, to fevers, to influenza and malaria. Then we have the group of *neurasthenic* and hysteric headaches; and finally those which are termed *reflex* or *sympathetic headaches;* amongst the latter are included the cases due to eye-strain, to errors of refraction and errors of accommodation, those due to disease in the oral, nasal, frontal, pharyngeal, and tympanic cavities, and those associated with uterine, ovarian, and sexual disturbances.

From the foregoing considerations it is clear that it is not always an easy matter to discover the original cause of a headache, and, as we have already said, the treatment of headaches is a complex subject, and to be successful it entails, as Oppenheim well observes, "a careful examination of the entire body, a minute dissection of all possible factors. . . . Symptoms of cerebral tumour, of cerebral syphilis, of meningitis, etc., must be sought after. The cranial cavities must be examined, the special senses tested.

Errors of refraction must be corrected. The condition of the heart and vessels and of the urine may furnish important points."

We will now pass on to the consideration of the treatment appropriate to some of these groups, and first, of

Anæmic headaches.—Headaches occurring in women with the manifest symptoms of chlorosis and anæmia are described as *anæmic* headaches. In such cases there exists in all probability a special sensitiveness of the nervous system, together with some special defect in the action of the excreting glands induced by the anæmia; so that there is not only a defective nutrition of the nervous tissues, but irritation of them by defective elimination of toxic substances. The pain of these headaches is usually more or less continuous, not paroxysmal; although it suffers temporary aggravation and amelioration. The pain may be referred to the forehead, vertex or occiput, most commonly the vertex. It is usually increased by mental or bodily effort, and relieved by rest in the recumbent position. Disturbed digestion, constipation, depression of spirits, drowsiness by day, insomnia at night, dizziness, and various neurasthenic manifestations, tend to accompany this form of headache.

The *indications* for **treatment** are to restore the blood to its normal condition, to relieve digestive troubles, and to promote due elimination by aperients, and suitable exercise and regimen. Change to mountain air (the seaside aggravates the digestive troubles in some cases), with regulated exercise, careful feeding, and hydrotherapy, are of great service. The general principles which we have laid down for the treatment of anæmia and chlorosis apply to these cases, and will not be here repeated. Suitable aperients are always needed. Iron and arsenic are the best tonics; the milder preparations of iron are fittest. If there is notable cardiac weakness, coca, strychnine, and occasionally small doses of digitalis may be needed. Opium should be avoided; it will relieve pain, but it interferes with elimination, and its use is neither physiological nor rational. Small doses of morphine and atropine given hypodermically may, however, occasionally be needed in the distinctly neuralgic forms. Nitro-glycerine has been advised in doses of $\frac{1}{200}$ to $\frac{1}{150}$ grain; it may give temporary relief. Inhalations of oxygen and of nitrous oxide have also been recommended, and they may be tried in exceptionally severe and troublesome cases. In neurotic cases a pill of valerianate of zinc (1 grain) and phosphorus ($\frac{1}{60}$ grain) twice a day, if taken for a few weeks at a time, will often prove of great service. The syrup of the glycero-phosphates (Robin) has been of use in such cases. Treatment at a chalybeate spring, such as Schwalbach, attended as it necessarily is with rest and change, and plenty of fresh air, will be beneficial to many.

We should be very cautious how we encourage the use of alcohol in these cases; the relief it affords can only be temporary, and the craving for it we may excite may be permanent. Tea, coffee, guarana, are all safe and useful remedies. One or two small doses (5 grains) of antipyrin or phenacetin may, in some cases, be given to relieve very severe attacks. Insomnia is best treated by 10- to 20-grain doses of sodium bromide, together with tincture of hop in half-dram or dram doses.

Cannabis indica, chloral, amyl nitrite, and various other drugs have been recommended, but we have not found them trustworthy.

Neurasthenic headaches are closely allied to the preceding. The so-called "clavus hystericus" refers to a form of pain in the head (the vertex) compared to that caused by driving a nail into it. These cases, when anæmia is present, require the same kind of management as the preceding. The neurasthenia must be treated in the manner described in a subsequent chapter. Massage to the head will sometimes give great relief to such cases, and a course of hydrotherapy is very often of great service. In some of those cases in which it would not be practicable, or perhaps desirable, to carry out the complete Weir-Mitchell rest cure, a partial application of it has been suggested by its author, to be carried out as follows:—

On waking in the morning a small cup of cocoa, then rest for twenty minutes; then a sponge bath, the patient lying on a blanket, followed by brisk friction of the skin; then dress, rest for twenty minutes, and breakfast; after breakfast one hour's rest; 10 a.m., massage, and then an hour's rest. After each meal an hour's rest; four or five glasses of milk should be taken during the course of the day, and 1 to 3 ounces of fluid extract of malt should be taken with each meal.

Drug habits are readily acquired by such patients, therefore drug treatment should be avoided as much as possible. When, however, owing to the acuteness of the pain, something must be given for its relief, the best remedy is antipyrin (5 grains) combined with caffeine (1 grain) every ½ hour for four doses. A small cup of strong coffee with two teaspoonfuls of brandy will often give relief; but we must be very cautious in the use of alcohol in these cases, as a craving for it is readily developed.

Congestive headaches may arise from various causes—from over-indulgence in food and drink; from imperfect elimination and constipation in free livers; from excessive mental labour and worry; from pulmonary or cardiac conditions interfering with the venous return; and from suppression of habitual discharges, as at the menopause, etc. These headaches are distinguished by pulsation and throbbing of the vessels of the head, flushing of the face, and over-full superficial veins; by aggravation of the pain in the recumbent position; and by giddiness, and visual and aural sensory disturbances. Digestive troubles are often present.

The *indications for* **treatment** are, *first*, to correct the habits of life on which the state may depend; *secondly*, to relieve the circulatory disturbances, when possible, which may cause the congestion; *thirdly*, to promote free elimination; *fourthly*, to give immediate relief to the over-loaded vessels.

Sharp purging and the application of cold to the head in the form of an ice-cap will best fulfil the last indication. The application of leeches has been suggested, and so has compression of the carotids. Placing the feet and legs in hot mustard and water, or mustard plasters to the inside of the thighs (in women), are good derivatives. A mustard plaster to the nape of the neck is useful in some instances. In refractory cases a seton has been found useful. Oppenheim has "observed in some cases headache which had existed for years, often preventing the victim from working, completely disappear after the application of a seton." As has already been remarked, Mr. Whitehead, of Manchester, has also testified to the value of this measure in cases of migraine. A few doses of bromide are often valuable to allay cerebral excitement; but the therapeutic indications in this form of headache are causal, and we have little confidence in the use of analgesics. Most of these analgesic remedies have already been mentioned in the preceding sections, but it is clear they can only be palliative in cases such as we are now considering. Sodium salicylate will be found useful in gouty subjects. A spare diet, the avoidance of stimulants, free action of the bowels, regular exercise, removal from business worries or overwork (mental or physical), a life in the open air, and a course of mineral waters, such as Carlsbad, Marienbad, Tarasp, or Kissingen—these are the rational means for relieving such hyperæmic conditions.

Toxæmic headache is, in a partial sense, a term which might possibly be applied, with correctness, to nearly *all* forms of headache. The treatment of headaches associated with uræmia, malaria, plumbism, uricæmia, etc., cannot be considered, profitably, apart from the general conditions upon which they are dependent. To so-called *dyspeptic* or bilious headaches, which obviously belong to this group, the same remark applies; the rational treatment of the headache is the treatment of the morbid state on which it depends. To refer all or nearly all headaches to uricæmia, as one author does,* and to treat them by abstention from animal food and the administration of salicylates, is not in accordance with our experience. Cholagogue aperients are undoubtedly of great service in the treatment of these headaches, as they very effectually promote the elimination of the toxic substances which excite them. Headaches dependent on gouty, rheumatic, or syphilitic *periostitis* will be relieved by potassium iodide, but this drug will often need to be given in large doses up to 20 or 30 grains thrice daily. It may be combined with nux vomica and sal volatile to counteract its depressing effect.

The treatment of *sympathetic* or *reflex* headaches will usually fall into the hands of the specialist. Those dependent on disorders of the sexual organs, of the uterus and ovaries, will be cared for by the gynæcologists. Headaches taking their start from carious teeth must be remedied by the dentist. Those, and they are numerous, dependent on ocular disturbances will require the aid of the ophthalmologist.

Nasal and *aural* specialists assure us that many cases of obstinate headache arise from disease of these cavities. The most common cause, we are told, is the presence of *adenoid* vegetations in the naso-pharynx, and with their removal the headache disappears. *Hypertrophy* of the *middle turbinated body*, it is stated, is another frequent cause, and intense headaches are reported to have been cured by "resection of the bulk of the middle turbinated bodies."

Clearing out and disinfecting the *frontal sinus;* irrigation for *empyema* of the frontal sinus; opening of the ethmoidal and sphenoidal cells; puncture and irrigation for empyema of the antrum; all these operations have been reported as attended by relief of otherwise incurable headaches.*

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* *Brit. Med. Journal*, Nov. 4th, 1899, p. 1247.

Aural surgeons also report the cure of distressing headaches by suitable operations on the aural cavity.

INSOMNIA.

Of the intimate nature of sleep, as a function of the brain, or of the precise changes in the brain upon which it is dependent, we have no accurate knowledge. It is difficult, therefore, to approach the subject of the remedial management of loss of sleep from a scientific standpoint. We know, however, many of the conditions, physical and mental, upon which the loss of sleep commonly depends, and we may hope that, in many instances, our efforts to remove or antagonise these conditions may result in its restoration.

We must especially recognise, in different individuals, great differences in what we may term **cerebral stability.** A slight irritation will suffice to produce cerebral instability and agitation in one individual, with consequent loss of sleep, which would be quite inadequate to induce any such disturbance in others. Most persons who have been distinguished by the faculty of great physical and mental endurance, and the power of sustained mental effort, have also been endowed with great cerebral stability. Great efforts may leave them with an exhausted brain, but with no great disturbance of its stability. In others, less happily endowed, mental efforts leave the brain not only exhausted, but irritated and unstable. The faculty, therefore, of resting and sleeping well often, but not always, goes with the faculty of working well. A peculiar, and often inherited, hyper-sensitiveness or instability of the nervous system lies at the root of habits of sleeplessness in many cases; hence it is in the neuropathic and the hysterical that we find the most troublesome examples of this condition.

In considering the exciting causes of insomnia we may divide them broadly into *physical*, *mental*, and a combination of the two.

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* *Brit. Med. Journal*, Nov. 4th, 1899, p. 1243.

Amongst the *physical* we should enumerate—(1) *physical pain*, or discomfort arising from injuries, diseases, or simply irritation of bodily organs; (2) the brain excitement developed during the action of the poisons of fevers and infective and other diseases; (3) the disturbances of brain function dependent on structural brain disease; (4) certain ingesta which, directly or indirectly, disturb that cerebral calm and stability which is necessary to sleep. We might separate a group or class of these physical agents and apply the term *toxic* to the group, which would be a somewhat ill-defined one.

We might divide the *mental* into intellectual and emotional disturbances, although in many cases they are inseparable. Excessive intellectual efforts, when they lead to cerebral instability and irritation, are frequently associated with emotional influences; as the anxiety of competition, the struggle for some uncertain end, or object, or the consciousness or dread of incapacity.

Emotional disturbances form the basis of the great majority of cases of insomnia—the passions of grief, anxiety, love, and the suspense and worries inseparable from social life.

It is clear that in this last class of cases our efforts to minister to their relief must often be attended with unsatisfactory results.

In *neurasthenic* states we usually encounter a combination of mental and physical agencies co-operating in disturbing brain stability.

The successful **treatment** of sleeplessness necessitates a careful investigation into the conditions which have given rise to it.

We will here refer, in the first place, to the management of those cases of insomnia dependent on the ingestion of certain articles of food and drink, or on certain **food habits**, into which we should carefully inquire. A very common and remedial cause of sleeplessness is the existence of some food habit which causes a disturbance of that physical and organic calm, at the hour of retiring to rest, which is needful, in the hyper-sensitive, in order to ensure sleep. The consumption of *cardiac excitants*, such as tea, coffee, and, with some persons, tobacco and alcohol, late at night, will sometimes effectually prevent sleep by the circulatory disturbances produced; yet, in the sleeplessness caused by over-fatigue, tea or coffee will often promote sleep by its restorative effect on the nervous system. The excitement of digestive activity, or the disturbances of gastric function caused by taking a full meal late in the day, especially in persons prone to dyspepsia, is a frequent cause of insomnia. Flatulent distension of the stomach, the irritation of gastric acidity, the upward pressure on the heart, and the palpitation thus excited, due to such improper habits of feeding, give rise to sleeplessness, which will be avoided by adopting different habits.

In cases of acid dyspepsia and flatulence, even without the existence of the habits referred to, sleeplessness may often be prevented by drinking a tumblerful of hot water in which 10 to 30 grains of sodium bicarbonate is dissolved, a quarter of an hour before bed-time. We have found this a valuable expedient, in many cases, where gastric acidity was not suspected to be the cause of the insomnia.

Habitual constipation, when it is attended with flatulent distension of the intestines, will often cause sleeplessness from the discomfort arising from the upward pressure of the distended intestines on lying down in bed. The remedy for this is the removal of the habit of constipation. An enema of 12 to 16 ounces of warm soap and water, with 3 or 4 tablespoonfuls of olive oil taken an hour before bed-time in such cases, will often prevent a sleepless night. If the first enema does not act satisfactorily a second may be given.

Exhaustion from insufficient food is occasionally a cause of insomnia. When this is the case the consumption of a little light, nourishing food, with a small quantity of some suitable stimulant, before retiring to rest, will cure the sleeplessness, such as a teacupful of beef-tea or gruel or arrowroot with a dessertspoonful of brandy.

Persons of studious habits, who work late in the evening and find they cannot sleep on retiring to bed, should discontinue their work about an hour before bed-time and take some out-of-door exercise before retiring to bed. It is most desirable to avoid any possible cause of excitement or worry at bed-time, such as reading sensational books, hearing exciting news, or reading letters on business, etc. To be the *sole* occupant of a cool and quiet bedroom is sometimes of much importance.

Often some quite minor physical discomfort will start the habit of sleeplessness, such as insufficient warmth in bed; or the contrary, too great heat of the bed, but particularly *cold feet* in bed. When the latter is the case, the remedy is to bathe the feet in hot mustard and water just before going to bed, dry them with smart friction, and put on well-warmed woollen socks for night wear.

A hot bath, by its action in restoring normal arterial tension, has been found of great use in many cases, and especially in cases of great mental excitement.

Massage, especially of the abdomen and lower extremities, will often induce sleep, possibly by diverting the blood to the vessels of those parts. We knew a medical man who was greatly troubled with insomnia until he tried general massage, and fell asleep during the process!

The methods of *hydrotherapy* are often successful in restoring sleep to the sleepless; but they are best carried out in an institution for the purpose, under a physician skilled in their application, as they require careful modification to individual cases.

In cases of nerve exhaustion, the application of electricity has proved useful. Jacoby * says he has known the "*head breeze*" in neurasthenic insomnia succeed "when all other remedies and all other forms of electric application have failed." Occasionally some very simple remedy will succeed. The late Dr. Elliotson said "he knew a lady who often remained awake in spite of everything, until her husband very gently rubbed her foot"!

But, too frequently, the treatment of insomnia resolves itself into the employment of some sedative or hypnotic drug, and the important point is to select that which will be the least harmful, and the least likely to establish an undesirable habit, and, above all, not to have recourse to it until all other measures have failed. We are not, of course, thinking of *acute* forms of insomnia, when a thoroughly reliable hypnotic may be an immediate necessity.

When the need of a narcotic is obviously temporary only, as for the relief of physical pain, after surgical operations, or in the course of acute or other disease, we need have no hesitation in giving it; but it is quite otherwise when we are dealing with the subjects of habitual insomnia, who too often develop a craving for sleep-procuring drugs, and who cannot be trusted to use them cautiously and occasionally.

It is often needful to distinguish between true nervous exhaustion from over-work and mental strain, and insomnia in persons of naturally weak and irritable nervous systems; hypnotics may be given to the former without much risk, but not to the latter.

Alcohol has a well-known power of inducing sleep, and if we could be sure that there was no danger of producing the habit of alcoholic indulgence, we might find in it one of the best of narcotics. But, except in large quantities, it has little influence over obstinate cases. In slight cases, however, a glass of bitter ale or stout at bed-time, or a tablespoonful or two of sound whisky with hot water, will frequently have the effect of inducing sleep. It probably acts by promoting dilatation of the vessels of the surface and establishing normal vascular tension. In other cases we have found 1 or 2 drams of tincture of hop in an ounce or two of some aromatic water, at bed-time, answer well. It is often advisable, in giving alcohol to procure sleep, to give it half an hour or an hour before bed-time, so as to allow the preliminary excitement of its action to pass away.

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* Cohen's "System of Physiologic Therapeutics," vol. ii., p. 191.

The value of *opium* for the relief of the insomnia due to *painful* disease is well known, and we have only to say here that it is, of all the means at our disposal, the least desirable for the relief of the chronic *habitual* cases we are now considering; but when sleeplessness is caused by *acute physical pain* some preparation of opium or morphine will be necessary to procure sleep.

The least objectionable of hypnotics for the relief of simple insomnia are the *bromides*, and the sodium bromide is the best for this purpose. It may be given in doses of from 10 to 30 grains in an ounce of chloroform water, or it may be combined with a dram or two of tincture of hop. This dose is of great value in the slighter emotional cases, and in many conditions of mental irritability. It is a good plan, in such cases, to give two or three doses of bromide during the day also. In cases of insomnia merely due to mental over-activity the bromides given in this way are all that is needed.

Chloral is a very certain hypnotic, and is of immense service when it is of great importance to procure sleep quickly, and so avoid grave cerebral exhaustion from protracted sleeplessness; but it has the disadvantage of being a cardiac depressant and a gastric irritant, and the habit of chloral-taking may be quickly induced. It should be reserved for occasional, not habitual, use, and for acute and not chronic cases; and it should be always given combined with about an equal quantity of bromide of sodium or potassium;

much smaller doses are then needed, and unpleasant after-effects are avoided. Fifteen grains will often suffice.

Chloralamide is a drug which is now used largely in the place of chloral, and it is regarded as a safer, though somewhat less powerful, hypnotic. The dose is 30 to 60 grains; and, as the taste is disagreeable, it is best given in capsules, or in solution with some aromatic tincture. It is less prone to cause gastric irritation than chloral. Prof. R. W. Wilcox* has found it "the safest of the hypnotics for the insomnia of patients suffering from cardiac disease," and "particularly useful in the insomnia resulting from excessive mental activity."

Sulphonal and *trional* are, however, the most popular and, perhaps, the safest of the modern hypnotics. It should be remembered that sulphonal is somewhat slow in producing its soporific effect, and it should be taken some time before sleep is desired. If taken on going to bed, it may be some hours in acting, and the patient may suffer from sleepiness the whole of the next day. Its soporific action has been observed to extend to the next night. This is an advantage in many cases, and for this reason it has been advised that it should only be administered on alternate nights. Indeed, its use should always be interrupted after a short time to allow of its *complete elimination*, which may be aided by aperients. Its combination with potassium bromide may be warmly commended; 10 to 20 grains of sulphonal with 20 grains of bromide in a cup of warm broth, milk, or chocolate, should be taken two or three hours before bed-time. Another method of giving sulphonal, which has been found useful, is to give half the dose (7½ to 10 grains) about an hour before late dinner, and the other half at bed-time. (This is a good plan with persons who wake up about 2 or 3 a.m. and cannot go to sleep again, a type of insomnia observed in the gouty and also in those who smoke late at night.) If dissolved in boiling water, it is found to act more quickly. Some have prescribed it mixed with whisky-punch. Some serious symptoms have been observed occasionally to follow the prolonged use of sulphonal, such as unsteadiness of gait, headaches, nausea and vomiting, and, most serious of all, the occurrence in the urine of hæmato-porphyrin, attended by abdominal pain, vomiting, and fatal collapse. The habitual use of this drug should therefore be strongly discouraged.

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* *Brit. Med. Journal*, Oct. 7th, 1897, p. 857.

Trional has the advantage over sulphonal of being more soluble, and its action is therefore more rapid, inducing sleep in from ten to twenty minutes. It is rarely that any unpleasant effects on waking follow its use. Like sulphonal, it should be given in some *hot* fluid (broth, milk, etc.), in which it dissolves more readily.* The dose is 10 to 30 grains. It should not be given for more than five or six consecutive nights, and it is advisable to give some alkali during the day (20 to 30 grains of sodium bicarbonate) to avoid hyper-acidity of urine, which is apt to arise, as with sulphonal, from the action of the hypnotic on the blood globules. The bowels should also be kept open, so as to promote elimination of the drug.

Tetronal has much the same properties as its congener, trional, over which it has no particular advantage. The dose and mode of administration are the same.

Chloralose, of which much was expected, has proved very disappointing. In small doses (2 to 5 grains) it is very uncertain in its action, and in larger doses it has been frequently found to give rise to serious toxic symptoms—tremors, nausea, and collapse.

Paraldehyde is a valuable hypnotic and free from unpleasant after-effects, except that of imparting a most disagreeable odour to the breath, which greatly interferes with its general adoption. Some, however, regard this as an advantage, as it tends to prevent its *habitual* use. It is given in doses of ½ dram to 2 drams, and usually acts with rapidity.

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* A form, recently recommended, of prescribing trional will be found amongst the additional formulæ at the end of the chapter.

Hyoscyamus and the alkaloids *Hyoscine* and *Hyoscyamine* are found most valuable hypnotics in cases of mental excitement in the insane, and we have also found a combination of bromides and tincture of hyoscyamus answer better than other hypnotics in the insomnia of chronic alcoholism.

Chloroform and *ether* inhalations are reserved for those cases of sleeplessness associated with some spasmodic affection which the anæsthetic allays.

In certain cases of insomnia with feeble heart and low arterial tension it has been found that the strengthening of the heart by *digitalis* or *strychnine* has restored the power of sleeping. It is necessary, therefore, in all such cases to attend carefully to the character of the pulse.

Hypnotism has been suggested for the relief and cure of insomnia, but it is a method of which we have a profound mistrust, surrounded as it is with subtle dangers, and it has failed conspicuously in the cases in which we have seen it applied. It is only right to add that Bradbury * thinks it a valuable therapeutic agent.

Formulæ for the administration of the chief hypnotics will be found amongst those appended to this chapter. The most difficult cases to deal with are those dependent on some far-reaching emotional disturbance. For these, travel, change of climate, change of life (especially a life in the open air), hydrotherapy combined with massage and electricity, are the best remedial measures; and drug treatment is probably the worst. As to *climate*, living in the open air in woodland districts of moderate elevation seems most conducive to the restoration of sleep. "An outing under canvas in the northern woods of Canada is a sleep producer of the most remarkable kind. I have seen men haunted for years by the demon insomnia go to these woods, and while there develop a sound sleep habit which added years to their life."* The air at the seaside and at high altitudes proves too exciting to some sleepless patients.

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* Allbutt's "System of Medicine," vol. vii., p. 756.

The treatment of neurasthenic cases is further dealt with in a subsequent chapter.

In conclusion, we would earnestly impress on all who have to deal with this troublesome condition the great importance of avoiding having recourse to hypnotic drugs except in cases of urgent necessity. But in cases of great and sudden mental or emotional disturbance, causing absolute sleeplessness, it is necessary to give a thoroughly effective and full dose of a reliable hypnotic to compel sleep, and so save serious nerve strain. Where there is no cardiac weakness a single full dose of chloral and bromide should be given at night, and two or three doses of bromide during the day. But in less urgent cases there are many other resources, as we have pointed out, for dealing with this state; and these, if judiciously urged, and combined with a little patience, will often succeed in overcoming this habit without inducing another, which is perhaps a greater evil—the habit of taking narcotic drugs.

The treatment of the insomnia dependent on acute or organic diseases, fevers, cardiac, renal, pulmonary and other diseases is considered in the chapters dealing with these affections.

It should be remembered that in chronic forms of insomnia where hypnotics may be needed for long periods it is very advisable to vary the drugs used.

A LIST OF OTHER *HYPNOTICS*, WITH BRIEF COMMENTS.

Amylene hydrate.—Dose, 30 to 80 minims in some flavouring medium. Intermediate in action between chloral and paraldehyde.

Apomorphine.—Recently reported to be a prompt and effective hypnotic in doses of about $\frac{1}{30}$th of a grain, hypodermically, *i.e.* a much smaller dose than that needed to produce emesis. It has been found to produce refreshing sleep in 25 minutes, and had no disagreeable after-effects. Its emetic action in large doses quite prevents the formation of a "drug-habit." Useful in delirium cases.

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* Professor C. K. Clarke, *Brit. Med. Journal*, Oct. 2nd, 1897, p. 854.

Butyl-Chloral Hydrus.—Dose, 5 to 20 grains in glycerine and water. Will frequently relieve the insomnia due to neuralgia of the 5th nerve.

Camphor monobromide.—Dose, 2 to 10 grains in pills with curd soap and proof spirit. Hypnotic in the insomnia of convulsive diseases.

Cannabis indica; Cannabin lannate; Cannabinon.—Dose of the extract, gr. ¼ to gr. j.; of the tincture, 5 to 15 minims. The inconstancy in the composition of its preparations, and the consequent uncertainty in action, are great drawbacks to their use. They also sometimes produce excitement. Cannabin tannate, dose 4 to 8 gr. in pill or in weak alkaline solution, and Cannabinon, dose gr. ½ to gr. j., have been found useful in the insomnia of the nervous and hysterical.

Chloretone.—Dose, gr. 5 to gr. 25 in a cachet, followed by a draught of water. Recently introduced; not very reliable.

Chlorobrom is a speciality containing chloralamide and potassium bromide, 30 gr. of each to the ounce; dose, ½ oz. to 1 oz. Its prolonged use is said to be well tolerated.

Dormiol (amylene-chloral).—Usually given in capsules containing 7½ minims, 1 to 5 for a dose. Said to be a powerful hypnotic, but not much is known as to its after-effects.

Hedonal.—Dose, 15 to 45 grains in a cachet. Said to be an "improved urethane," and to have the advantage over chloral and trional of being harmless. In the insane large doses are needed (up to 90 grains) to produce any effect. It may be described as a mild and harmless hypnotic in cases of simple insomnia.

Hypnal.—Dose, 15 grains in a cachet. A combination of antipyrin and chloral, and having the same properties as its constituents.

Lupulin.—Dose, 2 to 5 grains in a pill. A mild hypnotic; often given in alcoholic cases.

Metaldehyde.—Dose, 2 to 8 grains in cachets or pills. Has been found a useful hypnotic.

Methylal.—Dose, 15 to 30 minims with syrup and water. A hypnotic which is reported not to depress the heart's action.

Pellotine.—Dose, gr. $\frac{1}{3}$ to gr. j. An alkaloid obtained from a cactus growing in America. The chloride is soluble in water, and can be administered hypodermically. It has been well spoken of as a safe hypnotic by Prof. R. W. Wilcox, of New York, but at present it cannot be said to have established any claim to general use.

Piscidia (Jamaica Dogwood).—Dose of liquid extract, $\frac{1}{2}$ a dram to 2 drams. Reported to be an effective substitute for opium, relieving pain and inducing sleep without causing undesirable after-effects.

Uralium or *Ural.*—Dose, 15 to 45 grains. A combination of urethane and chloral. Uncertain in its action and attended with disagreeable after-effects.

Urethane.—Dose 10 to 60 grains. Advocated in the insomnia of cardiac disease, but very uncertain in its effects.

ADDITIONAL FORMULÆ.

For migraine.

℞ Sodii salicylatis, gr. xlv.
Sacchari lactis, gr. xxx.

M. et divide in pulv. vj. A powder every hour at the time of the attack.

(*Bamberger.*)

Another.

℞ Caffeinæ bromhydratis, gr xv.
Quininæ bisulphatis, gr. xxij.
Sacchari albi, gr. xxx.
Olei menthæ piperitæ, gutta j.

M. et divide in pulv. x. Three to be taken in the day.

(*Bamberger.*)

Aperient pills in migraine.

℞ Quininæ sulphatis, gr. xv. ad gr. xxx.
Extracti aloes aquosi, gr. lxxv.
Pulveris et extracti glycyrrhizæ, q.s.

Ut f. pil. lx. Two night and morning. (*Bamberger.*)

For migraine.

℞ Phenazoni (antipyrin), ʒjss.
Potassii bromidi, ʒiv.
Spiritus chloroformi, ʒij.
Aquæ camphoræ ad ℥viij.

M. f. mist. A large tablespoonful when the attack comes on, and a dessertspoonful every morning and evening between the attacks. (*Whitla.*)

For headaches.

℞ Sodii salicylatis, gr. xv.
Potassii bromidi, gr. x.
Spiritus ammoniæ aromatici, ʒss.
Aquæ ad ℥j.

M. f. haust. To be taken three times a day. (*Brunton.*)

For migraine.

℞ Quininæ sulphatis, gr. xv.
Caffeinæ citratis, gr. xv.

M. et divide in pulv. vj. One for a dose during the attack. (*Benedikt.*)

In the intervals.

℞ Sodii bromidi, ʒv.

Divide in pulv. xx. Take one night and morning. (*Benedikt.*)

Pills to be taken in the intervals of attacks of migraine.

℞ Sodii arsenatis, gr. ij.
Extracti cannabis indicæ, gr. iv.
Extracti belladonnæ, gr. v.
Zinci valerianatis, gr. xlviij.

M. et divide in pil. xxiv. One to be taken after breakfast and dinner. (*Little.*)

For the same.

℞ Extracti cannabis indicæ, gr. $\frac{1}{6}$.
Extracti nucis vomicæ, gr. $\frac{1}{4}$.
Ergotini, gr. j.

M. f. pil. To be taken three times a day after meals.

Or,

℞ Extracti cannabis indicæ, gr. $\frac{1}{6}$.
Pulveris digitalis, gr. ss.
Ferri lactatis, gr. ij.

M. f. pil. To be taken three times a day after meals.

Or,

℞ Extracti cannabis indicæ, gr. $\frac{1}{6}$.
Acidi arseniosi, gr. $\frac{1}{60}$.
Ferri pulveris, gr. j.

M. f. pil. One three times a day, and may be increased to two or even three thrice daily.

(This and the above are intended for prolonged administration.)
(*Prof. Wharton Sinkler.*)

For migraine and ocular migraine.

℞ Butyl-chloral hydrate, gr. xxx.
Potassii bromidi, gr. lx.
Glycerini, ʒiv.
Syrupi aurantii, ℥j.
Aquæ ad ℥vj.

M. f. mist. Two tablespoonfuls for a dose. (*J. B. Y.*)

Caffeine mixture for migraine.

℞ Caffeinæ, gr. xxxvi.
Sodii salicylatis, gr. lx.
Syrupi floris aurantii, ℥j.
Aquæ ad ℥vj.

M. f. mist. One tablespoonful for a dose. (*J. B. Y*).

For syphilitic headaches.

℞ Sodii iodidi, ʒjss.
Morphinæ hydrochloridi, gr. jss ad gr. ij.
Extracti et pulveris glycyrrhizæ, q.s.

Ut f. pil. lx. Four pills night and morning (to be kept in orris powder).

And,

℞ Hydrargyri perchloridi, gr. jss.
Sodii chloridi, gr. ix.
Aquæ, ℥ijss.

M. f. solutio. For hypodermic injection, dose about five minims. (*Benedikt.*)

For sympathetic headache of ovarian disease.

℞ Ammonii bromidi, ʒvj.
Extracti hydrastis fluidi, ℥ss.
Tincturæ gentianæ compositæ, ℥jss.
Aquæ, ℥iv.

M. f. mist. A dessertspoonful three times a day.
(*Sinkler.*)

For hysterical headaches.

℞ Zinci valerianatis, gr. xij ad gr. xxiv.
Extracti belladonnæ, gr. ij ad gr. iij.
Extracti gentianæ, gr. xxiv.

M. et divide in pil. xij. One three times a day. (*Tanner.*)

For nervous headache.

℞ Tincturæ hyoscyami, ℥ss.
Spiritus ammoniæ aromatici, ℥ss.
Syrupi aurantii, ℥j.
Aquæ menthæ piperitæ, ℥ij.

M. f. mist. A tablespoonful for a dose, with water.
(*Wright.*)

For insomnia at the menopause.

℞ Potassii bromidi, gr. xx.
Tincturæ sumbuli, ʒss.
Tincturæ lupuli, ʒj.
Aquæ camphoræ ad ℥j.

M. f. haust. At bed-time.
(*Bradbury.*)

In simple insomnia.

℞ Lupulini, gr. iij.
Camphoræ, gr. iij.
Extracti hyoscyami, gr. jss.

M. et f. pil. ij. To be taken at bed-time. (*Steward.*)

Or,

℞ Tincturæ lupuli, ʒj ad ʒij.
Sodii bromidi, gr. xv.
Aquæ chloroformi ad ℥jss.

M. f. haust. To be taken at bed-time.

For insomnia with flatulent dyspepsia.

℞ Sodii bicarbonatis, gr. xx.
Spiritus ammoniæ aromatici, ʒss.
Spiritus chloroformi, ♏xx.
Aquæ menthæ piperitæ ad ℥jss.

M. f. haust. To be taken at bed-time with an equal quantity of hot water.

Insomnia with mental excitement.

℞ Hyoscine hydrobromidi, gr. $\frac{1}{200}$ to $\frac{1}{100}$.

To be administered hypodermically.

Elixir of paraldehyde for insomnia.

℞ Paraldehyde, ʒijss.
Tincturæ vanillæ, ʒss.
Spiritus vini rectificati, ℥jss.
Aquæ destillatæ, ℥iij.
Syrupi simplicis ad ℥v.

M. f. elixir. One or two tablespoonfuls for a dose.
(*Yvon.*)

A hypnotic draught.

℞ Chloral hydratis, ʒss.
Potassii bromidi, ʒss.
Liquoris morphinæ bimeconatis, ♏xxx.
Syrupi aurantii floris, ℥ss.
Aquæ destillatæ ad ℥iij.

M. f. haust. Half to be taken at bed-time, and the remainder in three hours, if necessary.
(*Whitla.*)

Formula for trional.

Trional, 15 grains.
Oil of sweet almonds, 5 drams.
Sugar, 2 drams.
Gum arabic
Gum tragacanth } āā 3 gr.
Orange flower water, 2½ drams.
Cherry laurel water, ½ dram.

Make an emulsion. To be taken in water or milk.

The trional dissolves in the oil, and given in this way we avoid the inconveniences dependent on its sparing solubility in water.

Or it may be given as an enema, thus:—

Trional, 10 grains.
Oil, 4 drams.
Yolk of egg, 1.
Water, 5 ounces.
Mix.

CHAPTER V.

THE TREATMENT OF CHOREA AND OF PARALYSIS AGITANS.

Chorea, its Nature and Characteristic Symptoms—Causation—Relation to Acute Rheumatism and Endocarditis—to Emotional States—Microbic Theory—Influence of Educational Strain—*Treatment*—Rest and Food—Drugs—Sodium Salicylate—Strychnine—Antipyrin and Antifebrin, etc. etc.—Rest Cure—Baths and Douches—Gymnastics—Massage—Electricity—Value of Arsenic—Zinc Compounds—Sedatives and Hypnotics—Cimicifuga—Conium—Hyoscine—Bromides and Chloral—Chloralamide—Sulphonal—Morphine—Chloroform Inhalation—The "Wet Pack"—Ether Spray—Generalities.

Paralysis Agitans—An Incurable Disease—Its Causation—Symptoms and Clinical Features—Course—*Treatment*—Avoidance of Excitement—Electricity—Massage—Rubbing—Tonics and Sedatives—Passive Movements and Carriage Exercise in Open Air. Additional Formulæ.

CHOREA is a **neurosis** of **early life** the pathogeny of which is still involved in obscurity. It has been described as a form of functional exhaustion of the central nervous system, associated with vascular disturbances affecting the motor tract in the brain and spinal cord. It would seem, however, to be rather a morbid *irritability* or excitement of the motor centres, which no doubt may lead eventually to functional exhaustion.

It is readily distinguished by its highly characteristic **symptoms,** the chief of which depend on frequent, irregular, involuntary movements of various groups of muscles, especially those of the arms, legs, face, and tongue, and in some cases the muscles of the trunk also. The irregular action of these muscles causes the arms and hands to move about in an odd, purposeless fashion ; the legs and feet also keep moving and shifting their position ; the facial muscles by their irregular contractions give rise to all kinds of grimaces and gestures ; the tongue is suddenly protruded and retracted, without any object, and the eyes are rolled about, and the head turned from side to side. When the muscles of the trunk are also involved, as is the case in severe forms, the whole body may be moved and tossed about in bed, so that the elbows and other bony prominences get bruised and excoriated. It occasionally happens that the choreic movements are almost, if not quite, limited to one side of the body (hemichorea). Even in the slighter cases all the voluntary movements are disturbed, interfered with, and often perverted by the uncontrollable irregular actions of the muscles, so that all voluntary actions are performed awkwardly and with effort. The power of speech is lost or greatly interfered with in all but the slighter cases. There is usually much restlessness and sleeplessness, and these symptoms may become so pronounced as to be of serious import, and, combined with violent muscular movements, may lead to a fatal result from exhaustion. Considerable emaciation from inability to take food occurs in these graver forms. These irregular involuntary movements usually cease during sleep, and from this circumstance it has been inferred that the motor excitement or disturbance must be cerebral and not spinal. It is almost exclusively a neurosis of *early* life, and is especially prone to occur between the ages of 5 and 15. It is extremely rare after 20. It is most common at the age of 13. It is also far more common in girls than boys. Osler's statistics, which accord fairly with those of other observers, give girls 71 per cent. and boys 29 per cent.

Chorea is very frequently associated with the existence of **cardiac murmurs**, especially a systolic murmur over the mitral area, and although in some cases, doubtless, these murmurs may be functional and hæmic, yet there seems good reason for believing they are more commonly caused by co-existing or pre-existing endocarditis, and that they indicate mitral incompetence. Chorea is also frequently preceded by a history of **acute rheumatism.** This brings us to a very troublesome and difficult point in the pathological history of this disease—viz. to determine the precise relation of chorea to rheumatism and endocarditis. Those who go so far as to regard chorea as in all cases a rheumatic disease, and dependent on rheumatic endocarditis, and its characteristic manifestations as determined by emboli—particles of fibrin and vegetations—detached from the surface of the inflamed valvular endocardium and carried into the cerebral vessels, encounter serious difficulties in attempting to establish their position.

In the first place, it is common to observe rheumatic endocarditis in children without any symptoms of chorea, and such symptoms do not ordinarily occur even in those cases of *ulcerative* and other forms of endocarditis in which we know that emboli are conveyed from the cardiac valves into the vessels of various organs. Again, if choreic attacks were caused by the conveyance of emboli from the cardiac valves into the vessels of the brain, we ought in these cases to find evidence also of the lodgment of emboli in other organs, as the spleen and kidneys, where they are most commonly arrested, and this we do not find.

Then the statistics of the co-existence of rheumatism and chorea, and the antecedent occurrence of rheumatism to chorea, collected by different investigators, differ very widely. American physicians give the proportion as 17 to 21 per cent., German observers make it much lower than this, and some English and French physicians much higher. Prof. G. Sée estimates the proportion at nearly 50 per cent. The results of the collective investigation of the committee of the British Medical Association gave about 26 per cent.

Thus we have a vast proportion of all cases of chorea which cannot be traced to antecedent rheumatism; and while some may be disposed to lay great stress on the fact that rheumatism has been observed in 26 per cent. of cases of chorea in England, others may be excused for giving also great weight to the observation that in 74 per cent. no such relationship has been discovered.

We have also to weigh the undoubted fact that attacks of chorea not unfrequently come on *immediately* after some **emotional** disturbance—most commonly fright of some kind—and that it occurs in about the proportion of 3 to 1 in the more emotional sex. It is especially prone to occur in highly strung, nervous, and excitable children, and in many cases there would seem to be an indirect neuropathic heredity, a history of epilepsy and insanity being traceable in their families.

In connection with the arthritic complications observed in some cases, it may be mentioned that a *microbic* origin of chorea has been suggested, and it has been urged that as it is impossible, in many cases, where endocarditis and chorea co-exist, to refer the chorea to endocarditis, or the endocarditis to rheumatism, they both may have their origin in a common cause—viz. some infective agent, which is capable also, in persons predisposed, of exciting articular disease.

We must then, for the present, be content with the fact that there certainly appears to be a close relationship between chorea and acute rheumatism. We should also note that endocarditis, with disease of the mitral valve, has been found to exist in nearly all fatal cases.

Chorea occasionally occurs in young pregnant women, usually in first pregnancies, and between the second and fifth months; in these cases it often assumes a severe form, and may probably be referred to an emotional origin, from the circumstance that it generally occurs in the *unmarried.*

Although **anæmia** has been advanced as a cause of chorea, there seems to be no sufficient basis for this statement; it is apt to occur in chlorotic girls at the period of puberty, and it may itself lead to anæmia, but anæmia must not be looked upon as affording anything more than a predisposition to the disease.

Educational **strain** and the emotional disturbances inseparable from school and college competitions seem to be a fruitful cause of chorea in girls. It has sometimes been observed to follow injuries and slight surgical operations. A well-marked tendency to recurrence is a feature in this disease.

From the preceding brief reference to the etiology and pathology of chorea, it will be seen that we can be scarcely said to possess any *causal indications* for *treatment.*

Rest and **good feeding** are sufficient, it has been maintained, to cure the large majority of cases of chorea, and these are undoubtedly most important conditions of cure; but so long as the physician bears in mind the fact that even the slighter forms of this affection may develop into the graver and uncontrollable ones, he will be anxious to adopt whatever therapeutic measures are available to prevent so serious a possible development of the malady. The **indications,** then, for the **treatment** of cases of chorea may be thus stated:—

1. To rapidly relieve, if possible, the slighter forms, so as to prevent their development into the graver forms, or their passing into a chronic state.

2. To relieve restlessness and sleeplessness, and so obviate fatal exhaustion in the more severe cases.

Of the vast array of drugs that have been proposed in the treatment of chorea there are many which may be dismissed very briefly. Apomorphia, lobelia, belladonna, cypripedium, cannabis indica, aniline, picrotoxine, amyl nitrite, and tartarised antimony may be at once rejected, as more likely to do harm than good. Of the salicylates and the iodides, we have only to remark that they may serve as remedies for co-existent rheumatism, but that they have not appeared to us to have any special value in the treatment of chorea. Sodium salicylate has, however, been administered as a germicide on the hypothesis that chorea is due to microbic infection.

Quinine in large doses has the great authority of H. C. Wood in its favour, but, except in convalescence, as a tonic, we have not obtained any noteworthy results from its use.

Strychnine has the high authority of Trousseau to recommend it: and we believe its administration may be valuable in cases where symptoms of nervous exhaustion and cardiac debility, rather than those of nervous irritation, predominate; and as a cardiac and nervine tonic, after the choreic symptoms have to a great extent passed away, it may also be useful. But for the central excitement and irritability, upon which the more serious choreic phenomena depend, we do not regard it as a suitable remedy.

Antipyrin and antifebrin have both been advocated for the treatment of chorea, as depressants of the excito-motor functions of the spinal cord. The latter we should unhesitatingly condemn as a dangerously depressing drug; and we are not greatly impressed with the suitability of the former. Exalgine in doses of 1 to 3 grains three or four times a day has been extolled by Professor Joseph Collins,* who has pushed the dose up to 30 grains in twenty-four hours. He admits that in large doses its use is sometimes attended by very serious symptoms, while its hæmolytic action is well known. We confess to an objection to the use of drugs so potent for evil!

We are disposed to add to this list of undesirable, or uncertain, so-called remedies for chorea, the nitrate and oxide of silver and the sulphate of copper.

We have thought it right to mention these various drugs, as they all of them get more or less credit, from different observers, in the treatment of chorea, and in some troublesome and intractable cases others may wish to give them again a trial.

We shall now consider those remedies which appear to us more worthy of confidence; and we would place first of all what has been termed the

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* Hare's "System of Practical Therapeutics" (new edition), vol. ii., p. 760.

"**rest plan**"—rest for a certain time wholly or partially in bed, according to the severity of the case, together with light but supporting food. At first the rest should be *absolute*, and no occupation, even by way of amusement, should be permitted. If practicable, it is best to confide the child to the care of a nurse, apart from the rest of the family. As the patient improves a little exercise of the mildest kind may be allowed. In fine warm weather the patient may be swung in a hammock, or may recline on a couch, in the open air. Rest allays nervous and muscular irritability, and if endocarditis exists by quieting the action of the heart and reducing its labour it reduces the strain on the valve segments to a minimum. Educational tasks must not be thought of until long after the cure has been completed. Indeed, as a preventive, or to arrest the tendency to recurrence, all neurotic and sensitive children should be protected from educational strain and worry. The food should be nutritious but simple, and such as can be easily digested. While the patient is in bed an exclusive milk diet may be appropriate: and if milk is not well borne, koumiss has been found to answer well; but a mixed diet of eggs, fish, meat, and milk is often well tolerated. Tea, coffee, alcohol, and sweets must be avoided, and also too much farinaceous food.

While referring to the matter of food, we may add that in those severe cases in which feeding by the mouth is difficult nutrient enemata must be given. The cold wet pack has been found very soothing and sleep-procuring, and so has a daily warm bath of ten to fifteen minutes' duration, followed by the quick passage of a cold wet sponge down the spine; in somewhat chronic cases, in young chlorotic or hysterical girls, without any cardiac complication or rheumatic tendency, a tepid or cold douche to the spine every morning for 15 seconds will often be found to be followed by vast improvement. The water should at first be tepid, and the temperature gradually lowered. In summer the water can often be used at once of the natural temperature, and may be "dashed forcibly against the back of the neck and spine once or twice a day."

Gymnastics and massage have their uses also in the treatment of chorea; the latter may be serviceable for stout anæmic patients whose muscular movements are not sufficiently under control to benefit by gymnastics, which are only suited to slight or chronic cases, with but little muscular inco-ordination. The gymnastic movements most suitable to the treatment of chorea are rhythmic ones with the accompaniment of singing.

We have had but little experience of the application of *electricity* to the cure of chorea; but Dr. Constantin Paul has applied the electric bath with advantage in certain cases, and Rockwell states that "when a case has continued without amelioration for several months" he regards "electricity in some form as far superior to any and all other methods of treatment." He uses both "general faradisation and central galvanisation; the ascending current is to be preferred in the treatment of chorea located in a single muscle or group of muscles, and general faradisation is far more efficacious when the disturbances are at all general. If the applications are skilfully made, they will act both as a tonic and as a sedative, to allay irritability and induce sleep." Jacoby,* however, is by no means impressed with the value of electrical treatment in these cases; he says, "My own experience has been such as to warrant me in saying that better results can be obtained in nearly all cases of chorea by some other means . . . . and that the only permissible mode of treatment is central galvanisation, or subaural galvanisation combined with anodal applications to the affected parts."

Of medicinal agents, there is a general consensus of opinion as to the value of **arsenic** in the treatment of chorea. It probably acts as a tonic and improves the general nutrition; but the large doses needed, in many cases, in order to ensure its beneficial effect lend some support to the suggestion that it may exert a special influence either over the nerve cells involved or over some possible microbic irritant in the system. It is usual to begin with a full dose of 5 minims of Fowler's solution thrice daily, and to increase the dose by 1 minim daily until it reaches 15 minims. This dose should be continued for about a week, and then again increased every three or four days until the physiological effects of the drug become manifest; the arsenic should then be discontinued for a few days. Tolerance is soon established, and the medicine may be again resumed in full doses. Seguin has given as much as 27 minims for a dose, which he prescribes diluted in a large quantity of water, and taken in divided drinks after meals. It may be given in water flavoured with a little syrup of orange or lemon peel. Sachs judiciously suggests that the night dose should be combined with a dose (15 or 20 grains) of potassium or sodium bromide. Some prefer to give arsenic by the hypodermic method, with the idea that they obtain more quickly the full remedial effect with much smaller doses. 1 to 4 or more minims of Fowler's solution, mixed with 15 minims of liquid vaseline, have been thus given. Some French physicians have also administered *cacodylate of sodium* hypodermically with the same object; beginning with ⅓rd of a grain, the dose has been gradually increased to ⅔rds daily. It has also been given successfully by rectal injections.

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* Cohen's "System of Physiologic Therapeutics," vol. ii. p. 186.

The **zinc** compounds were, at one time, much used in chorea; the sulphate, the oxide, the valerianate, and the phosphide; the oxide or the sulphate in doses of 3 to 5 grains, after a meal, three or four times a day, the dose being gradually increased to 8 or 10 grains. The phosphide is indicated only in cases of great nervous exhaustion; it may be given in doses of $\frac{1}{20}$th to $\frac{1}{10}$th of a grain three times a day in a pill with 1 or 2 grains of extract of hyoscyamus.

The valerianate and the bromo-valerianate in 1- to 3-grain doses, thrice daily, made into a pill with extract of henbane in the same way, we have found answer exceedingly well in cases where arsenic appeared to exercise but little beneficial effect. Indeed, we have found this drug often answer better than arsenic in florid, well-nourished children whose chorea has been apparently of rheumatic origin, as well as in some hysterical forms.

The usefulness of sedatives and hypnotics in the severer cases cannot be doubted; and even in the slighter cases, if they are accompanied by insomnia and nocturnal restlessness, we hold it as an indication of the first importance to procure sleep. If we neglect this indication, we must be prepared to see the slighter cases often develop into the graver and more troublesome forms.

Both cimicifuga and conium are of use in the treatment of chorea; the former is more valued in America than in England.

Conium is especially valuable on account of its sedative properties, and is therefore applicable to cases accompanied by restlessness and insomnia; but its quieting action is brief and evanescent, and larger and still larger doses are needed to maintain its influence; the succus conii has been given in from 1- to 7-dram doses hourly. It is chiefly as a temporary expedient that it is of use, and Whitla states that in one case he considers it "kept the child alive until the arsenic had time to act."

Hyoscyamine, or hydrobromide of hyoscine, given hypodermically, in doses of $\frac{1}{100}$th to $\frac{1}{80}$th of a grain, has been found a most efficient remedy for arresting the exhausting movements in the severer cases. It has been pushed until its physiological effects (dryness of the mouth and dilatation of the pupils) are observed. The dose of $\frac{1}{100}$ grain several times daily will usually suffice. Bourneville and Katz have given bromide of camphor in 3-grain doses in capsules with rapidly good effect in some cases.

Hypnotics are also urgently indicated when there is sleeplessness. Rest to the nervous system must be obtained if we would avoid the risks of fatal exhaustion. In the milder cases a few doses of sodium or ammonium bromide (10 to 20 grains) combined with chloral (10 to 20 grains) given at bed-time and repeated during the night, if necessary, will often be attended with remarkable amelioration of the general symptoms, and natural sleep will follow without the need of further repetitions of this dose.

In more severe cases larger and more frequent doses may be necessary, and rectal injections of chloral have been found very useful—10 to 30 grains dissolved in 2 or 3 ounces of water thrown into the rectum every five or six hours, if necessary.

Bouchut gave 45 grains of chloral after the morning meal, so that the child might sleep till noon, and 45 grains more after its mid-day meal; the child usually wakes up about six for his supper and falls asleep again afterwards. In this way he sometimes kept the choreic child asleep during several days.

The free administration of chloral has been found most serviceable in the *chorea of pregnancy;* keeping the patient in a continual sleep, waking her up only for meals, the food at the same time being limited to milk and eggs. In these cases arsenic must be used with caution. In severe cases it will sometimes be necessary to produce abortion or premature delivery.

Chloralamide has been found efficacious as a hypnotic in 10- to 30-grain doses, and so also has sulphonal; and *trional,* in 10-grain doses three times a day, or in a single dose of 20 grains at bed-time, has been very favourably reported on.*

It is rarely advisable to give morphine or opium until other drugs fail in procuring sleep. They should then be given with caution and preferably by the mouth, as morphine administered hypodermically sometimes produces a very depressing effect on the heart.

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* *Brit. Med. Journal,* Feb. 1st, 1902, p. 267.

In the gravest cases, when the movements are very violent and uncontrollable, and the patient can with difficulty be retained in bed, and the prominent parts of the body become bruised and excoriated, inhalation of chloroform may be needed; we should push the inhalation to complete narcotism, otherwise the patient will soon reawaken, and the amount of chloroform ultimately consumed will be greater. Dr. Churton has recorded a case * (a girl seventeen years of age) in which, after the failure of chloral in frequent doses of 20 grains to restrain the choreic movements, he succeeded in keeping them completely under control by giving morphine hypodermically, followed by the inhalation of chloroform for a few minutes. He began with $\frac{1}{6}$ grain of morphine, but had to increase the dose to $\frac{1}{2}$ grain before he obtained the desired result. Osler advises the "wet pack" in these cases as likely to prove very soothing.

Hypnotics should be discontinued as soon as possible.

Lubleski, of Warsaw, applies ether spray along the spine for five minutes at a time, night and morning, by means of a Richardson's apparatus; he considers it often diminishes the intensity of the choreic movements.

A prolonged lukewarm bath at night has also been found very calming, and has relieved insomnia.

It is still necessary to add a few generalities. When the spasmodic movements are severe steps must be taken to prevent the patient injuring his limbs or bruising the soft parts; he should, therefore, lie on a soft and broad mattress, well provided with pillows, and preferably on the floor—the knees, elbows, and other parts exposed to injury may be wrapped in cotton-wool. It may be

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* *Brit. Med. Journal,* March 24th, 1894.

needful to provide a water-bed as a protection against bed-sores, and the most scrupulous cleanliness with regard to the evacuations, etc., must be carried out. Alcohol, in moderation, should be given in severe cases when exhaustion is threatened. The bowels should be kept relieved by mild aperients. Anthelmintics should be given if there is any reason to suspect intestinal worms, and all possible sources of irritation should be sought out and removed, defective teeth, the constipated habit, errors of refraction, etc., etc. In anæmic cases, and in convalescence, iron and other tonics, such as quinine and strychnine, will be needed. Cardiac tonics, such as digitalis and strophanthus, may also be required if the heart's action is feeble and when valvular disease exists. If cases tend to become chronic, notwithstanding treatment by rest and seclusion, change of air and scene should be prescribed. Guard carefully against recurrence, especially during the spring,* by protecting the rheumatic from chill, and the sensitive and neurotic from all over-exertion or strain, mental or physical, and look to the maintenance of the due nutrition of the body.

PARALYSIS AGITANS.

Shaking Palsy—Parkinson's Disease.

This is an easily recognised disease of the nervous system not associated with any constant lesion, but due probably, as Gowers suggests, to a premature senile alteration in the motor cortex of the brain. A very brief sketch of its clinical characters must suffice as an introduction to an account of the therapeutic measures which have been recommended, from time to time, by neurologists for the alleviation of the symptoms that attend it, as all authorities appear to be agreed that the disease is not curable by any known methods of treatment.

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* Weir-Mitchell recommends that arsenic should be given as the spring begins in cases where there is a fear lest "the habit of vernal recurrence of chorea" should be established ("Lectures on Diseases of the Nervous System").

The symptoms are very characteristic, and resemble those which are observed in senility—viz. *muscular tremor, muscular weakness, and muscular rigidity.* Gowers speaks of it as "a true senile affection. . . A failure of nutrition of special character in special structures." Its *causation* is somewhat obscure. It is more common in women than in men, and it is rare to meet with it before middle age. A great variety of exciting causes have been put forward, the chief of which are prolonged mental emotion, severe mental shock, worry and anxiety; exposure to wet and cold; physical injuries; specific fevers; and as a contributing cause the fact of belonging to a neurotic family.

Of the *symptoms* the *tremor* usually begins in one of the hands, and is associated with weakness and stiffness of the muscles. The tremor is usually, at all times, most marked in the hands. At first it is not constant, but appears after any exertion. Next to the hand it affects the ankle joint. Commencing on one side of the body it extends after a time to the other.

There is also in advanced cases some vertical head-shaking (as in old age), aggravated by emotion and due to contraction of the muscles of the neck. The tremor will often cease for a time during *voluntary movements*, but after any considerable effort will return with increased intensity; indeed, great excitement of any kind increases the tremor. A *distinctive* feature is that the tremors continue while *at rest!* This distinguishes it from most other forms of tremor. They cease, however, during sleep, although they often hinder the patient from falling asleep. Passive movements arrest the tremor temporarily, and in some cases even for a long time.

Owing to the muscular weakness the movements are slow and deliberate, and the muscular *rigidity* imparts a stiffness as well as slowness to the voluntary movements. The *attitude* and *gait* are peculiar; the head and back are bent forward, the arms are somewhat abducted, and held in front of the body; the face is expressionless and mask-like; the patient walks with short, hurried steps (festination). It has been observed that the *rigidity* is relatively the most prominent feature; that it is this that retards and impairs active movements, and that this rigidity and characteristic gait and expressionless face may precede the tremors.

The sensibility is unimpaired, but these patients are very apt to complain of heat, and more rarely of cold. The mental condition is unchanged except for a very natural feeling of depression.

The *course* of this disease is progressive, but usually the progress is very slow, and so far as life is concerned the prognosis is favourable; such patients generally die of some intercurrent affection.

From this brief sketch of the chief features of this disease we pass on to a consideration of its **treatment,** which it must be admitted is not satisfactory. Oppenheim says "the physician may do much harm and little good," and Gowers observes that "of all the degenerative diseases of the nervous system this is the least amenable to therapeutic agents."

It is important to avoid all causes of excitement, mental calm being of great importance. Baths and health resorts are, therefore, better avoided, and a quiet country life (being much in the open air) should be preferred.

Electricity has been found by Gowers to have no influence. Oppenheim thinks massage and electricity of no benefit, but electric baths, especially the bi-polar faradic, have done good in certain cases, and Jacoby admits that "hydro-electric baths often bring about temporary relief of certain minor symptoms," but "only by their psychic effect."* Gowers considers massage gives only slight temporary relief, but "gentle upward rubbing of the fingers and hands" relieves the tremor, and Oppenheim has found that rubbing down with warm water or warm baths may do some good. Systematic exercises have seemed to be beneficial.

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* Cohen's "System of Physiologic Therapeutics," vol. ii., p. 187.

Such tonics as quinine, arsenic, and strychnine are useful, but we must avoid "over-stimulation of too excitable tissues." Gowers prefers a combination of tonics and sedatives, as Indian hemp with arsenic and very small doses of strychnine.

Oppenheim found tincture of veratrum viride, 3 to 4 drops several times daily, lessen the tremor in several cases; he combines it with tincture of gelsemium. Erb gives large doses (m. vj. to m. xii.) of Fowler's solution with nux vomica. Both Erb and Oppenheim have given hyoscin and sulphate of duboisin, and found them useful for quieting the tremor; but these drugs, being powerful poisons, have to be used with great care to avoid their toxic effects. The dose of either is about $\frac{1}{200}$ grain to commence with.

To relieve sleeplessness it may be necessary to give bromides or chloralamide or sulphonal. It is usually desirable to avoid giving morphine.

Charcot noticed that some of these patients were better when travelling by rail or in carriages, and on this account vibratory chairs and other mechanical means of treatment were introduced, but Oppenheim* has found them of little benefit.

A simple but nourishing diet should be prescribed and all strong stimulants avoided, such as alcohol or strong tea and coffee. The patient's apartment should be well ventilated. Being much in the open air in a fairly bracing climate has been found advantageous. Carriage exercise, as has been pointed out, allays the tremor.

In advanced cases, owing to the muscular weakness and unsteadiness, the patient should not be allowed to walk about by himself, for fear of accidents.

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* "Diseases of the Nervous System" (Mayer's translation), p. 839.

ADDITIONAL FORMULÆ.

Oxide of zinc in chorea.

℞ Zinci oxidi, gr. iij ad gr. vj.
Sacchari albi, gr. lxxv.
M. et. div. in pulv. vj. A powder three times a day. (*Bamberger.*)

Hypodermic injection of arsenic.

℞ Sodii arsenatis, gr. jss.
Acidi carbolici, ♏iij.
Aquæ destillatæ, ʒijss.
M. f. solutio. Initial dose for hypodermic injection = five minims. (*Widerhofer.*)

Arsenical mixture for chorea.

℞ Liquoris Fowleri, ♏xxx ad ♏xlv.
Syrupi simplicis, ℥j.
Aquæ ad ℥viij.
M. f. mist. A tablespoonful three times a day. Also application of constant current along spine. (*Benedikt.*)

Another.

℞ Liquoris arsenicalis ♏lxxx.
Syrupi zingiberis, ℥j
Aquæ cinnamomi ad ℥iv.
M. f. mist. Two teaspoonfuls, gradually increased to four or more, three times a day after meals. (*J. B. Y.*)

Pills for chorea.

℞ Asafœtidæ, gr. xx.
Extracti valerianæ, gr. xx.
Zinci oxidi, gr. x.
Castori pulv., gr. xx.
Extracti belladonnæ, gr. jss.
M. et. div. in pil. xx. One or two night and morning. (*Dujardin-Beaumetz.*)

Bromide of potassium pills for chorea.

℞ Potassii bromidi, gr. lxxv.
Pulveris et extracti glycyrrhizæ, q.s.
Ut f. pil. xx. Five pills twice a day. (*Bamberger.*)

Also,

℞ Chloral hydratis, gr. lxxv.
Syrupi aurantii, ℥jss.
Aquæ ad ℥ivss.
M. f. mist. A tablespoonful every hour until a sedative effect is produced. (*Bamberger.*)

Iron and arsenic mixture.

℞ Tincturæ ferri perchloridi, ʒijss.
Liquoris arsenicalis, ʒiij.
Glycerini, ℥j.
Aquæ chloroformi ad ℥v.
M. f. mist. A measured teaspoonful in water after food three times a day. (*Whitla.*)

Quinine, iron, and arsenic, for chorea.

℞ Ferri redacti, gr. j ad iij.
Quininæ sulphatis, gr. ij ad v.
Acidi arseniosi, gr. $\frac{1}{60}$ ad $\frac{1}{30}$.
In a pill or capsule, thrice daily. (*Sachs.*)

Tonic powders in chorea.

℞ Quininæ sulphatis, gr. $\frac{3}{4}$.
Ferri carbonatis saccharatæ, gr. $\frac{3}{4}$.
Sacchari albi pulveris, gr. v.
M. f. pulv. To be taken twice a day. (*Widerhofer.*)

CHAPTER VI.

THE TREATMENT OF EPILEPSY.

The different Forms of the Attack—Etiology—Warnings—Aura —*Petit 'Mal—Treatment:* (1) During the Paroxysm; (2) of the Pre-paroxysmal Stage; (3) in the Intervals—Preventive Measures in Predisposed Children, and Hygienic Treatment—Treatment in Colonies—Alkaline Bromides—Mode of Administering them—Bromism—"Salt Starvation"—Other Bromides—Flechsig's Method—Borax—Belladonna—Zinc Compounds—Digitalis and other Cardiac Tonics—The Bechterew Treatment—Cannabis Indica—Chloral—Nitrites—Antipyrin—Fleury's Treatment for Auto-intoxication—Treatment of *Syphilitic*, *Strumous*, and *Anæmic* Cases—*Management of Complications*—Coma—The *Status Epilepticus* —Surgical Treatment. Additional Formulæ.

By **epilepsy** is meant a disease of the nervous system, characterised by attacks of unconsciousness, with or without convulsions. These attacks, or "fits," as they are termed, are apt to *recur*, in a paroxysmal manner, at irregular intervals. When they take the form of a very brief loss of consciousness, without convulsions, the disease is known as the *petit mal*; when, on the contrary the loss of consciousness is attended with general convulsions, the disease is spoken of as the *grand mal*. *Epileptiform* convulsions—that is to say, convulsive attacks having a general resemblance to epilepsy, may occur as symptomatic of various forms of disease of the nervous system—as, for example, of syphilitic disease—but these are not regarded as instances of "idiopathic" or true epilepsy. Localised convulsions, without loss of consciousness, generally connected with definite cerebral lesions, may also occur, and they are known as cases of Jacksonian epilepsy.

As to the **causes** of epilepsy: childhood and youth are certainly predisposing ones. It begins frequently during childhood, and also about the age of puberty, and but rarely after 25 to 30; 50 per cent. are said to occur in the second decade.* It is generally considered that epileptiform convulsions, occurring in the adult, should be regarded as very probably due to syphilis or some other *local* lesion. It must always be kept in view that epileptic convulsions may depend on the existence of organic cerebral disease.

The influence of heredity as a predisposing cause of this disease is somewhat variously estimated by different authorities, but even those who regard hereditary influence as playing but a small part in the *direct* transmission of epilepsy, admit that the children of *neurotic* parents, those prone to suffer from migraine, neuralgia, hysteria, and insanity, are especially liable to become epileptics. Oppenheim maintains that hereditary influence can be traced in one-third of the cases, Gowers says in a half. *Alcoholic habits* and chronic lead poisoning in the parents seem to convey a decided predisposition to epilepsy in their children.

Whether *syphilitic* parents can convey to their children a tendency to epilepsy, in its idiopathic form, is doubtful ; but *symptomatic* epileptiform convulsions are frequently dependent on actual syphilis of the nervous system, which may be either transmitted or acquired.

The frequent occurrence of this disease in children in connection with attacks of scarlet fever seems to point to some peculiar effect of the toxins of scarlet fever on the nervous system—the same may be said of certain other infectious diseases, as influenza and, perhaps, measles.

Emotional shock, such as fright or anger, appears to be capable of inducing attacks of epilepsy ; masturbation and sexual and alcoholic excitement are also recognised causes. Epileptic seizures from injury (traumatic cases), as injuries to the head, especially in the neurotic and alcoholic, or irritation (reflex cases) of the nervous system, are not uncommon, such as injury to peripheral nerves, or irritations from scar, or from the pressure of a foreign body.

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* Oppenheim, *op. cit.*

Dentition, diseases of the nose, laryngeal polypi, menstruation, intestinal worms, dyspepsia, gall-stones, small surgical operations, have all been mentioned as exciting causes of epileptic convulsions. The removal of carious teeth, of foreign bodies in the ear, of errors of refraction, in persons afflicted with epileptic attacks, has been observed to be followed by a cessation of the fits.

It has recently been suggested by Voisin, Bouchard, Haig, and others, that the epileptic attack may be due to auto-intoxication—the retention of toxic material in the blood; and this view is supported by reference to the fact that the urine after an attack is richer in toxic products than that passed before the attack. Uric acid by some, ammonium carbonate by others, have been suggested as the toxic agents. Further observations in this direction will doubtless be made; at present the theory is by no means widely accepted.

It is unnecessary here to describe, in detail, the familiar phenomena of an epileptic seizure, but a few words will not be out of place on the occurrence of the so-called **aura** premonitory of the approaching attack, on some *post*-epileptic symptoms, and on the character of the attacks of *petit mal.* The epileptic *aura* is a localised sensation of a somewhat vague character occurring sometimes in the hand, or in a finger or toe, or in the epigastric or cardiac regions, and in the latter attended with heart-burn or palpitation; or it may be referred to a tender spot on some other part of the surface of the body. Disturbed conditions of the special senses may produce visual (flashes of light), auditory (noises and sounds), olfactory (unpleasant odours), and gustatory (disagreeable tastes) *auræ.* A strange dreamy state, or one of fear and dread, may also precede the attack. Or certain motor *auræ* may be observed, such as rotatory or running movements.

These epileptic auræ may last from a few seconds to several minutes, or even longer, and it has been a question whether, on the observance of these warnings, the attacks might not, in some cases, be prevented; as they have been noted to sometimes occur, and pass away, without the supervention of fits.

A loud scream or yell usually indicates the onset of the epileptic convulsions and state of unconsciousness.

After the attack has passed away the epileptic is sometimes left in a curious trance-like condition, in which he is not responsible for his actions; he retains no recollection of them, and in this state homicidal tendencies (mania) are occasionally developed. Sometimes transient hemiplegia and defects of speech may follow an attack, and sometimes much mental feebleness may be the result. It is important to remember that epileptic attacks may occur at night without the patient being aware of them.

Attacks of **petit mal** frequently assume such a variety of forms that their nature is, no doubt, often misunderstood and unrecognised. The attack may be of such brief duration, the patient continuing to perform automatic actions, that it may pass unnoticed by the bystanders, or the patient may stagger and catch at something for support, or he may feel giddy and sit or lie down, or he may interrupt whatever he is engaged in for a minute or two, and then go on again as though nothing had happened.

A vacant stare, with slightly dilated pupils, and some pallor of the face, are often the only noticeable signs of such an attack. We should remember that what are termed "fainting fits" in children are often of this nature. Occasionally slight convulsive twitching of certain muscles of the face and neck accompany these minor attacks.

The pathology of epilepsy still remains obscure, and the *principles of treatment* of this affection must be based rather on observation of the phenomena of the attack, and on the results of experience, than on the theories of pathologists.

The **treatment** of the epileptic may be regarded from three points of view: (1) the treatment during the paroxysm; (2) the treatment when the paroxysm is imminent—what may be termed the pre-paroxysmal stage; and (3) the treatment in the intervals.

It is scarcely needful to say that the history and circumstances of each case must be thoroughly investigated so that the presence of any exciting cause may not be overlooked, the removal of which might lead to a cure; such as intestinal worms, the irritation of undigested food, constipation, carious teeth, foreign bodies or polypi in ears, etc., cicatrices involving peripheral nerves, alcoholism, plumbism, syphilis, etc.

1. The treatment during the paroxysm is simple. The patient should be placed reclining on some soft, flat surface, where he cannot do himself any injury during the violent convulsions. As the tongue is apt to be badly bitten by getting between the firmly-closed teeth, it is advisable to place between the teeth a bit of stout indiarubber tubing, or a wedge-shaped piece of strong cork, or something which will not be hard enough to injure the teeth, while it is tough enough to resist being bitten in two and swallowed. The head should be slightly raised, and all tightly-fitting clothes loosened.

Inhalations of nitrite of amyl (5-minim capsules) have been credited with the power of lessening the convulsive movements, and there can certainly be no objection to trying its effect, especially when the convulsive movements are violent or prolonged. Inhalations of chloroform and hypodermic injections of morphine (¼ grain) have been used for the same purpose. The sleep which usually follows an attack should not be disturbed. In the case of nocturnal attacks provision should be made to prevent, if possible, the patient turning over on his face at the end of an attack, which brings with it the risk of death from asphyxia.

2. The treatment of the pre-paroxysmal stage

may next be considered. In cases where the attack is preceded by a well-marked *aura*, it is no doubt possible in some instances by the adoption of suitable measures to prevent the attack. An old and familiar expedient is to tie a string round the limb in which the aura is felt, between its place of origin and the rest of the body. The application of a blister has been said to have the same effect. Cases are also on record in which the seizure has been prevented by cauterisation of the spot from which the aura proceeds, or by the application of laudanum to a tender surface aura (*Wilks*), or by extension of the leg muscles when the fit used to be preceded by jerking and flexion of the limb (*Reynolds*), or by forcible extension of the fingers when the attack followed spasmodic closure of the hand (*Bazire*). Such expedients are, however, of very uncertain efficacy. Dr. J. C. Da Costa states that in the Philadelphia Hospital it was found that a sudden electric shock was especially apt to be successful, and "almost as successful whether applied between the seat of sensation and the nerve centres or at some distant portions of the body." Both Weir-Mitchell and Crichton Browne testify to the utility of inhalations of nitrite of amyl in abating an epileptic fit, if administered as soon as the deadly pallor of the face appears, or when first the warning aura is felt. Gowers observes that "if it produces flushing of the face before the patient loses consciousness, the attack is usually cut short," and he thinks it especially useful in those cases with an olfactory aura.* Intelligent patients should be advised to carry capsules of nitrite of amyl about with them, so as to inhale deeply the contents of one as soon as the usual warning is experienced. Nitroglycerine given hypodermically has been found to have the same effect. Fits that occur with some sort of regularity may sometimes be modified or prevented by giving a large dose of potassium bromide a few hours before the expected attack. Oppenheim, however, thinks that the "artificial repression of an attack is not always advisable; it often leaves behind a condition of depression and irritability, combined with headache and vertigo, so that many prefer the attack."*

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* "Epilepsy" (second edition), p. 298.

3. We must now pass on to the chief consideration in connection with the treatment of epilepsy—viz. the *treatment* in the intervals between the paroxysms; and with this we may include the preventive treatment of the disease in the predisposed.

It is held by some physicians that attacks of infantile convulsions afford an early indication of an epileptic predisposition. This is certainly not always the case, but it is possible that it may be so in children of neurotic parents. After such attacks it is a wise procedure to put these children on a mild course of bromides for three or four weeks, in order to allay the convulsive tendency. Any source of peripheral irritation must, of course, be sought out, and, if possible, removed, such as worms, phimosis, dentition, gastro-intestinal irritation, etc. As they grow up, such children require firm, but gentle, control and discipline. Out-of-door exercise and occupation should be enjoined, so that when bed-time comes the child should feel a wholesome desire for rest and sleep. Violent emotional disturbances should be specially guarded against by early training to obedience and self-restraint, and all competitive tasks should be forbidden.

All stimulating and exciting foods and drinks should be prohibited, such as coffee, tea, and alcoholic beverages. The diet should be plain and simple, containing only a small amount of animal food, but composed chiefly of farinaceous foods and milk.

An ample proportion of sleep, in a well-ventilated bed-chamber, is an excellent tonic to a feeble, nervous system; wakefulness should be especially guarded against in the neurotic child as both exhausting and exciting; sometimes a little simple food, such as a glass of milk, or a cup of bread-and-milk, at bed-time, or during the night, will enable a wakeful child to sleep. It must be remembered that digestion in quickly-developing children is often very rapid, and the need of food at short intervals is apt to be lost sight of, and a child may be wakeful on account of hunger.

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* "Diseases of the Nervous System," p. 780.

The acquirement of evil sexual habits must be especially guarded against. It is advisable, if restful sleep at night cannot otherwise be secured, to give a small dose of bromide at bed-time.

The occurrence of constipation must also be prevented; and it must be insisted upon that a daily solicitation of the bowels, at a regular fixed hour, should be the invariable practice—a practice very commonly neglected by young growing girls. Instead of laxative medicines (of which a dose of Gregory's powder, or of the compound liquorice powder, is best), the regular introduction into the diet of some aperient vegetable or fruit is advisable; boiled spinach, onions, watercresses, lettuce, oranges, bananas, and stewed figs and prunes are all suitable. Anæmia, or signs of nerve-exhaustion, indicate the need of ferruginous tonics, with lime salts, such as the compound syrup of the hypophosphites, or the syrup of the iodide of iron. A combination of small doses of bromide and iron answers exceedingly well in some cases.

Mental tasks must be imposed with great moderation, and all competitions, as we have said, avoided, and exciting, emotional literature forbidden.

By the careful study and application of the foregoing suggestions we may hope, in many instances, to prevent the neurotic child from becoming an epileptic youth.

The main object of **treatment** in the **intervals** between the paroxysms is to prevent the occurrence, or diminish the frequency, of the convulsive seizure. Complete cure of epilepsy is rare, and has not been noted in more than 5 to 7 per cent. of cases under any method of treatment.

We have anticipated much that need be said on the matter of the *hygienic* treatment of the epileptic, in what has immediately preceded. The same rules of life which we have just laid down as applicable to neurotic children, with a proneness to epilepsy, will apply with equal force to those who have actually become epileptic.

With regard to food, there is a considerable weight of evidence in favour of restricting the epileptic to a vegetarian diet and milk. A marked diminution in the frequency and the severity of the seizures has been observed in many cases to follow the limitation to purely vegetable food. After a time, if the patient wishes it, fish and eggs in small quantities may be permitted. The food, of whatever kind, should be always moderate in quantity, well prepared, and easy of digestion. All stimulating beverages and tobacco are best avoided. Food just before bed-time should be forbidden. The sexual passion should be kept under severe control; and in this matter the usual medicinal treatment by bromides greatly helps us, by lessening the sexual appetite.

Marriage is, of course, out of the question.

Occupation should, if possible, be found for the epileptic, but it should be free from all excitement and strain.

Regular daily exercise should be insisted on, and a regular action of the bowels should be seen to.

In Germany and in the United States *colonies* have been founded on an extensive scale for the education and treatment of epileptics, and one on a smaller scale exists near London, at Chalfont in Buckinghamshire. In these colonies the patients are submitted to such restrictions that control of their acts is at all times secured. Those who arrive in feeble health are treated on hygienic principles directed to the restoration of their physical vigour. For this purpose various means are employed: medicines, systematic occupation, gymnastic exercises, baths, a special diet, and the application of such *moral* influences as may be needed. The occurrence of *aura* is looked for and studied, and investigations are undertaken with the view of detecting the presence of any toxic substances in the blood, urine, or other secretions that may bear any causal relation to the attacks.

The nature and amount of their food are strictly regulated. Alcoholic stimulants are prohibited. Tea, coffee, and tobacco are permitted (in American colonies) in moderation. A patient whose habits have been sedentary is gradually induced to live in the fields, exposed to the sun and air. An attempt is made to throw his life into new channels. All mental efforts and strain are avoided and physical exercises freely enjoined. But, if the physical development preponderate, efforts are made to develop co-equally the weak intellect. Recognition and encouragement are given to any wholesome natural bent or inclination in the way of mental or physical work. These regulations, as applied in the Craig Colony, U.S.A., have led to the cure of 6 to 8 per cent. of all cases coming there.

No *medicinal* treatment of epilepsy that has, as yet, been discovered at all equals in efficacy the alkaline **bromides.** Their beneficial effects are attributed to their influence on the cerebral cortex, diminishing greatly the excitability of the cells of the motor areas. They also diminish reflex irritability by their sedative action on the sensory tracts in the cord.

In a few cases the administration of the bromides leads to permanent cure; but in the majority it simply inhibits the attacks, and on the cessation of the treatment the convulsions are apt to recur. They have been found of less value in the *petit mal* than in the *grand mal*, and in nocturnal than in diurnal attacks. The bromides, in some cases, after a time, lose their protective power; and in a certain number of instances they fail to be of use at any time. A certain method should be adopted in the administration of the bromides, and especially in the adaptation of the dose to particular cases, and in the selection of the most suitable combination.

Originally the potassium bromide was the salt invariably prescribed, but of late years there has been a tendency to endeavour to replace this salt by other bromides, and especially by the sodium and ammonium bromides. The sodium bromide is, no doubt, less irritating, and much less depressing to the circulatory and muscular systems, than the potassium compound; and it is better tolerated during long periods of use; but some physicians maintain that it exerts less control over the epileptic paroxysms than the potassium salt. The ammonium bromide, if given alone in large doses, has been found excessively irritating to the stomach. In short, most authorities are agreed that the best results are obtained from the **mixed bromides.** Some use the potassium, sodium, and ammonium bromides in equal parts; and others prefer two parts each of the potassium and sodium salts to one part of the ammonium salt. It is best to give the larger doses, which we are sometimes obliged to administer, *well diluted* with milk, which almost completely disguises the taste, or with milk and some alkaline mineral water, such as Vichy, Vals, or Apollinaris.

With regard to the appropriate dose, we must study each case and note the individual susceptibility to the medicine, and regulate the dose accordingly; some individuals will require much larger doses than others. We should remember that children are generally very tolerant of the bromides, and will often bear nearly as large doses as adults. Females usually require less than males.

It is best to commence with small doses—15 to 30 grains thrice daily for adults—and gradually augment the dose until we ascertain the amount needed to suppress the attacks. Gowers maintains that if

30 grains three times a day "do not produce arrest, larger doses are seldom successful." Some give rapidly-increasing doses until anæsthesia of the palate and pharynx is induced (this may be ascertained by touching these parts with a feather), which takes usually about three weeks, and then the dose is decreased. Some French authorities consider the dose should be pushed, till the attacks disappear, even up to 5 or 6 drams a day. Very much depends on the *purity* of the bromide, and when any disappointment occurs in the result expected, this point should be looked to. If the fits are known to occur, with regularity, at some particular part of the day, or at other stated intervals, we should give a single large dose three or four hours before the usual time of the attack and smaller doses in the intervals. In nocturnal epilepsy we should give 50 or 60 grains an hour or two before bed-time. If the attack is prone to occur after getting up in the morning, we should give 30 or 40 grains at bed-time and repeat this dose on first waking in the morning. When the bromides are being taken regularly twice or thrice daily, it is best to give them about an hour after food, in order to avoid their occasional irritative effect on the gastric mucous membrane, and for the advantage of combining with them a small dose of arsenic to prevent acne; but when we are giving single doses, with the view of producing an immediate and decided effect, it is best to give it when the stomach is empty, so that it may be quickly absorbed unmixed with food.

In the administration of the bromides in epilepsy, whilst it is necessary not to stop short of giving the quantity needed to produce the effect desired, it is also important to be on our guard against what has been justly termed its "ignorant and excessive use." It is well known that when saturation of the system has been reached, if the doses are not diminished, the most unpleasant symptoms of **bromism** appear.

The following are the symptoms which may be observed when this state of bromism has been induced: The complexion is dark and muddy, the skin cold and clammy and covered with acne, there is complete anæsthesia of palate and pharynx, the action of the heart is feeble and hurried, there are great impairment of memory, dilated pupils, hesitating speech, mental confusion and torpor, loss of sexual power, great drowsiness, unsteadiness of gait, and, together with these symptoms, bronchial and gastric catarrh with fœtor of the breath may appear. A state of dementia is sometimes induced. The signs of the development of bromism during the prolonged use of the bromides should be looked for, and when they appear the medicine should be stopped or the doses greatly diminished. Gowers points out that the cerebral depression may be diminished by adding nux vomica or strychnine to the bromides with a little hydrobromic acid, and that 2 or 3 grains of caffeine to each dose will relieve the drowsiness. We must not however, regard the appearance of acne alone as a sign of saturation; this disquieting and disfiguring eruption will often occur after quite moderate doses in certain individuals; it is best avoided by giving the drug largely diluted with some alkaline water, and by combining it with full doses of Fowler's solution from time to time.

Richet and Toulouse have suggested and carried out a method which they assert enables them to diminish greatly the dosage of the bromides without lessening their curative effects. It is the method of "salt starvation." By depriving the nervous system of the usual amount of salt in the food, the nervous tissue is rendered more susceptible to the absorption of medicinal salts, which it takes up to a remarkable extent, and so renders a small dose effective. They have thus been able, with a daily dose of 30 grains of sodium bromide, given under the conditions mentioned, to arrest epileptic attacks, sometimes in less than a week, no matter how frequent they had been before, and several patients showed no recurrence for six months since the treatment. Corroboration of these observations is, however, needed.

The next question for consideration is, how long is it desirable that the use of bromides should be continued after the convulsive attacks have ceased to recur? Certainly for two or three years, the dose being reduced gradually during the third year. This is the plan followed by the most experienced authorities.

Cases in which we must not expect much good to result from the bromide treatment are those dependent on inherited tuberculosis, those dependent on injuries or deformities of the skull, those caused by dentition, those due to syphilis (and requiring specific treatment); while cases difficult to influence favourably are those excited by menstruation, those accompanying mental disturbances, and those which are traceable to alcoholism in the parents. Masturbation provokes a return of the seizures, and interferes greatly with the good effect of the bromides. It is a good plan, as suggested by Osler, for the nurse or attendant, or a near relative of the patient, to keep a book in which the number and period of the attacks are recorded, as well as the quantities of the bromides given.

Broadbent has recently expressed an opinion adverse to the routine and free administration of bromides in epilepsy. He thinks "the relief of symptoms, the diminished frequency and mitigated violence of the fits may, in many instances, be too dearly purchased" by the "lowered tone of the nervous system, the loss of energy and memory, the lessened efficiency, the depression of spirits, and impaired enjoyment of life," which excessive dosing with bromides often entails. He maintains that in order to cure the disease we must endeavour to remove the instability of the nervous system by other means. He would especially search in the patient's habits and general state of health for exciting causes of the attacks, and attempt to remove them.

"For the generally lowered vitality of epileptics" he would give phosphorus, and the hypophosphites, or arsenic with strychnine, and quinine and sometimes iron.*

Many other bromides have been used in the treatment of epilepsy besides those alkaline bromides we have been considering.

Lithium bromide has been found very useful in obstinate cases; it is given in doses of 5 to 15 grains.

Strontium bromide has been commended by Dr. Constantin Paul, who has seen it succeed after potassium bromide has failed. It is said also to be better tolerated than the latter: the dose is 10 to 30 grains. Gowers states he has not found it superior to other bromides.

Nickel bromide and *rubidium and ammonium* bromide have been advocated, but Gowers points out that they can only be given in small doses, which are without influence.

Bromide of *zinc* depends on the metal for its activity, not on the bromide it contains. It can only be given in small doses, as in large ones it proves emetic.

Monobromate of camphor has been given in doses of 5 grains three times a day, and slowly increased to 10, 15, and even 20 grains. It is best administered in *perles* of 2 grains each. It has been found of use in cases attended with much sexual excitement; otherwise it seems of little value in epilepsy.

Ethylene bromide has been highly spoken of by Oppenheim.† He gives it in oily emulsion containing 5 per cent. of the drug flavoured with a drop or two of oil of peppermint. Adults take 30 minims in half a glass of sweetened water 3 times a day, increasing the dose every third day by 10 drops until a teaspoonful is being taken. Children between 8 and

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* For the full development of these views the reader is referred to a "Lecture on Epilepsy," by Sir W. H. Broadbent, in the *Brit. Med. Journal* of Jan. 4th, 1902.

† "Diseases of Nervous System," p. 782.

10 years begin with 10 to 20 minims. It appears to be chiefly of use in cases of long standing. Further observations with this drug are needed. The value of hydrobromic acid in epilepsy has, we consider, been greatly overrated; its chief use is to acidulate bromide mixtures to which strychnine is added, in order to keep the latter in solution.

Bromipin or *brominol* is a combination of bromine and sesame oil. It is made of two strengths—one contains 10 per cent. and the other 33 per cent. of bromine. A dram of the latter corresponds to ½ a dram of potassium bromide. It is said to be very effective and to cause no rash and no depression, as alkaline bromides do. It can also be given by inunction into the skin, and by rectal injection. Given by the mouth it is not absorbed until it reaches the small intestine, where it is acted on by the bile and pancreatic juice. It can be given in capsules. It is a preparation that merits further trial.

What is termed the *Flechsig* method consists in *first giving opium*—¾ grain of the powder three times a day, gradually increased up to 15 grains or more daily. The opium is given for about six weeks and then completely suppressed, and bromides in large doses—2 drams daily—immediately administered. These doses are gradually diminished to 30 grains a day. The author of this treatment maintains that he has by it cured cases of epilepsy that have resisted all other kinds of medication, but Gowers remarks that the verdict of those who have tried the method is almost uniformly unfavourable.*

Although the bromides undoubtedly exercise a greater curative and palliative influence over this disease than any other drugs, yet it not unfrequently happens that their use fails to be attended with the benefit expected, or they disagree with the patient to such an extent as to preclude their continued employment; in these circumstances we must consider what other medicinal agents we may advantageously use in their stead.

* "Epilepsy" (second edition), p. 295.

Borax has recently been put forward as a valuable remedy in the treatment of epilepsy, and Gowers* considers it of use in inveterate cases in which the bromides prove of no effect. In some cases it seems of little use, whilst in others its influence is most decided, and a trial of the remedy would appear to be indicated in those individuals who cannot tolerate the bromides, and in those instances in which the bromides fail to produce any remedial effect. It is given in 10-grain doses at first, increased up to 80 or 90 grains daily, mixed with a little glycerine, syrup, and water. Smaller doses may be used combined with bromides. It should not be given in large doses at first, as it will sometimes cause diarrhœa with dysenteric stools. It occasionally, after long use, causes an eruption of psoriasis, which, however, usually disappears quickly on adding arsenic to the borax. Prof. Joseph Collins states, "after considerable experience with the use of borax in epilepsy," that its effect upon the disease is not "at all comparable to the bromides," but that for some cases in which the latter cannot be administered it is the best substitute.†

Belladonna, warmly advocated, before the day of bromides, by Trousseau in the treatment of epilepsy, has always been thought worthy of trial. He used to give it in small doses at first, a fifth of a grain of the powder and of the extract, in a pill, night and morning, for the first month, and every month an additional pill was added until the dose reached twenty pills twice a day. Oppenheim‡ uses the alkaloid *atropine*, and states that he has had good results from its use in cases in which bromides have failed. He begins with small doses, one-third to one-half a milligram ($\frac{1}{200}$ to $\frac{1}{125}$ grain), several times a day in adults, and smaller doses in children. He has been able to use it continuously for years, though with frequent interruptions.

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* "Epilepsy," p. 286.

† Hare's "System of Practical Therapeutics" (second edition), vol. ii., p. 781.

‡ "Diseases of the Nervous System," p. 782.

Gowers* considers the utility of belladonna as an adjunct to bromides "unquestionable" in increasing their effect. He has found the addition of 5 minims of tincture of belladonna to 15 or 20 grains of bromide greatly diminish the frequency of attacks, which the bromide alone had failed to do.

The cardiac tonics, *digitalis*, *strophanthus*, and *adonis vernalis*, have been found useful as adjuncts to the bromides in the treatment of many cases of epilepsy. They are useful in maintaining cardiac tone, which the bromides tend to depress, and their employment is especially indicated in cases complicated by cardiac disease, organic or functional. Gowers testifies that "attacks which continued on bromide alone ceased entirely on bromide and digitalis."

What is known as the *Bechterew* treatment consists in the administration of *adonis vernalis* combined with potassium bromide and codein. It is claimed for this method that the attacks are greatly reduced in frequency and in some cases completely suspended, while no bad results are observed. Digestion, circulation, and temperature remain normal and the mental condition unchanged.

Zinc compounds, and especially the *oxide*, have been found of value in epilepsy. Reynolds and Wilks testify to this effect. The oxide is given in 5-grain doses thrice daily. The citrate and the lactate are, however, preferred by many as less likely to cause stomach derangement; the dose of the former is 3 to 12, and of the latter 5 to 30 grains twice or thrice daily. Gowers considers that zinc has been too much neglected of late years, and that it commonly lessens the frequency of the attacks, and that it is of distinct service in the few cases in which the bromides fail, and especially in cases of slight or moderate severity, very seldom in severe cases. He prefers the oxide in pills (3 grains) after food, the dose to be increased when it agrees well. He found occasionally that combined with bromide it increased its influence over attacks.

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* "Epilepsy," p. 281.

Cannabis indica has its advocates, and is said to resemble the bromides in its action. It may be given in ½-grain doses of the extract, or 10- to 20-minim doses of the tincture, but it is not a reliable remedy.

Chloral is an auxiliary remedy in the management of certain troublesome cases of epilepsy with a tendency to insomnia, violent convulsions, or maniacal excitement. It is of value by exercising a calming effect on the disturbed motor cerebral centres, and on the motor tracts in the cord, and by inducing sleep it allays mental excitement. It is best to reserve its employment till the evening, and not give it during the day, and it acts best when combined with bromides. Gowers says he has not found it useful in *ordinary* cases of epilepsy—but it is *not* in the ordinary cases that its use has been advocated. In cases of cardiac debility it must, of course, be used with great caution.

Nitro-glycerine and the *nitrites*, sodium nitrite, nitrite of amyl, etc., have been of late years largely used in the treatment of epilepsy. They are all worthy of trial, especially in cases of *petit mal*, but their effects are too evanescent to enable them to be of much use in the graver forms. One drop of the 1 per cent. solution of nitro-glycerine or a grain of sodium nitrite may be given three times a day. Gowers has found it of "singular service" in some cases, and a "useful adjunct to bromides in cases with feeble circulation, coldness, and pallor of fingers, and small, slow pulse." Also in minor attacks in young children between 3 and 12 years of age. He has given it combined with strychnine in those cases with advantage. In the periodical headaches of epileptics he has found it beneficial combined with hydrobromic acid, 10 to 15 minims. Prof. Joseph Collins * has also found it "particularly beneficial" in cases in which a distinct vasomotor manifestation, in the shape of an aura, precedes the attack.

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* Hare's "System of Practical Therapeutics" (second edition), vol. i., p. 781.

Antipyrin given combined with ammonium bromide seems to be a real gain in the practical management of epileptic cases. Prof. H. C. Wood's recommendation of this combination (antipyrin, 6 grains, ammonium bromide, 20 grains) has been corroborated by many other competent observers. Its use was unattended by bromism or any unpleasant symptom. It seems to have had the power of alleviating some quite hopeless cases.*

Many other drugs (including *supra-renal extract*) have been put forward as of use in the treatment of epilepsy, but we have not thought it desirable to add further to the already long list of uncertain remedies. *Fleury*,† who believes in the theory of *auto-intoxication* as the cause of epileptic convulsions, looks for a remedy in a suitable diet and means to prevent the development of intestinal toxins. After this has been accomplished bromides become more efficacious. Meat is only partaken of once a day, the evening meal being vegetarian. Hot water is the only beverage permitted. To cleanse the intestinal canal aperients are freely given and copious enemata daily. If the stomach is dilated it should be washed out. Massage, cold douching, brine-baths, and mountain air he considers are all more or less important. He also thinks the hypodermic injection of an artificial serum —consisting of 1 per cent. of sodium chloride, sodium sulphate, sodium phosphate, and carbonic acid—useful, 8 to 10 grammes daily.

When the epileptic attacks are associated with any obvious constitutional vice or defect of nutrition, medicines directed to the relief of the latter, in combination with those more immediately directed to the prevention of the seizures, are clearly indicated. When there is any suspicion of syphilis, large doses of potassium iodide, 10 grains three times a day, gradually increased, must be combined with a mild bromide treatment, and mercurial inunctions if necessary. In feeble, ill-nourished, strumous cases, cod-liver oil should be prescribed; and, as we have already said, in anæmic cases small doses of iron are indicated. Strychnine has been found useful by Bartholow in anæmic subjects with signs of much nervous exhaustion and debility; its use, however, is chiefly appropriate in cases of *petit mal.*

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* A medical man writes to us from Cornwall of a case in which he followed this suggestion after other treatment had failed to relieve the fits, which occurred five or six times in the week and sometimes three or four in one night. He gave 5 grains of antipyrin with 10 grains of ammonium bromide three times a day, and at the time of writing the patient had not had an attack for three weeks, and was feeling very much better.

† *Journal de Médecine*, May 10th, 1900.

A seton introduced into the nape of the neck, blisters, and the actual cautery applied in the same situation, and the application of croton oil to the scalp, are rather expedients of the past than of the present. Electricity, in various forms and modes of application, has had many trials, but never with any striking results. Hypnotism and suggestion have been advocated, and it is not unlikely that in the hysterical forms they may meet with some success.

There are certain complications of epilepsy the management of which we may here briefly notice. *Prolonged* **coma** following an epileptic attack may require the application of an ice-bag to the head, or a blister to the nape of the neck, or the withdrawal of a few ounces of blood if there is evidence of cerebral congestion. On the other hand, high arterial tension, with a probability of great cerebral anæmia, would indicate the hypodermic injection of nitro-glycerine.

The **status epilepticus,** in which the convulsion passes into coma, and coma into renewed convulsion, without any recovery of consciousness, is often observed in asylums for the insane. It is a very serious condition, the mortality attending it being as great as 50 per cent., and active treatment is necessary to prevent a fatal result. *Chloral*, given by the rectum, 30 to 60 grains every hour, is a common expedient; some inject it hypodermically to the extent of 30 or 40 grains. This succeeds in some cases, but also often fails. It is advisable at the same time to give stimulating enemata to prevent too great cardiac depression. In cases attended with hyper-pyrexia Dr. Mott suggests the use of the cold bath.

Inhalations of *ether* and *chloroform* may be given for the immediate arrest of the convulsions, and to prevent exhaustion until other remedies act. *Amyl nitrite* has been warmly advocated by some, and found useless by others. The same may be said of large doses of potassium bromide.

Hypodermic injections of *sulphate of morphine* ($\frac{1}{3}$ grain) and *sulphate of atropine* ($\frac{1}{100}$ grain) have occasionally been found useful, but there is risk of causing serious cardiac depression with large doses of morphine.

Hyoscine hydrobromide, $\frac{1}{100}$ to $\frac{1}{80}$ grain, hypodermically, if great cardiac asthenia does not counter-indicate its use, has been found very efficacious in arresting convulsions and in inducing sleep.

A combination of *hydrobromate of conine* ($\frac{1}{100}$ to $\frac{1}{40}$ grain) with sulphate of morphine has been greatly praised for its efficacy in stopping the convulsions and bringing on a prolonged sleep.

The patient's strength must be maintained and the cardiac action supported by passing into the stomach, through the nasal tube and funnel, eggs, milk, stimulants, and quinine; and hypodermic injections of strychnine if necessary.

Epileptic mania and *epileptic dementia* require asylum treatment.

Finally, a few words must be said on the question of the **surgical treatment** of epilepsy.

As to the relief afforded by operation in epileptic cases, we have the testimony of Prof. J. W. White in his able paper on "The Supposed Curative Effect of Operations, *per se*," showing conclusively that the mere performance of an operation is *of itself* sufficient to produce, at any rate for a time, great relief. He refers to ninety cases of trephining in which nothing abnormal was found, yet great amelioration followed the operations, and two cases were apparently cured, the influence in these cases being doubtless psychic. But most authorities agree with Gowers in thinking this operation unjustifiable in all cases of *idiopathic* epilepsy. " Even in cases associated with idiocy, in which increased tension is supposed to have resulted from premature closure of the sutures, the effects of this operation have been generally unsatisfactory."*

There, are, however, cases of epilepsy directly referrible to some injury to the skull, in which no hesitation need be felt in counselling operation. If there is an external scar which is tender, and especially if an *aura* starts from the scar, the effect of removing the scar should be tried before trephining, especially if no depression or injury of the skull is discoverable. But if the injury is situated over a known centre, and the convulsions are limited to the group of muscles corresponding to that centre, the skull should be trephined and that centre removed.

But it is in cases of organic epilepsy without evidence of injury to the skull, the cases which Horsley has termed "focal epilepsies," that some difference of opinion exists as to the propriety of operation. Gowers holds that if the fits are local and partial, and if there is good ground for thinking there is disease that can be completely removed, then operation is justifiable; but if the convulsions are widely diffused, and extend to the other side of the body, the probability of benefit is too small to justify the very considerable risks of the operation. He considers that even if the primary lesion be removed the stability of nerve cells has been so disturbed that discharges will start from other cells. "Operation," he says, "should never be thought of in a case of idiopathic epilepsy in which the fits begin locally, because it is certain that the discharging tendency is widespread, and almost certainly adequate, in other parts, to cause fits." Oppenheim considers that if cranial lesion has preceded the epilepsy, trephining may be beneficial, firstly, when the attacks resemble those of cortical epilepsy, and secondly, when the cicatrix is over the motor zone. He hesitates to accept the view of Horsley and others that "not only the bones, the cicatricial meningeal tissue, the cysts, etc., must be extirpated, but also the cortical centre from which the irritation arises."

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* "Epilepsy," p. 308.

He concludes generally that the results of operations in traumatic epilepsy are not very encouraging, and he agrees with Von Bergmann that in most cases the effect of the operation is but temporary. He quotes Von Bergmann as disapproving of operative procedures in traumatic cases whose course resembles that of true epilepsy, and thinks they are not justifiable in cases of the psychic equivalents of epilepsy, even when a cranial injury has preceded.* It cannot be doubted that surgical enthusiasm and ardour with regard to "brain surgery" has recently undergone considerable abatement!

ADDITIONAL FORMULÆ.

Combination of bromide and atropine.

℞ Potassii bromidi, gr. xv.
Atropinæ sulphatis, gr. $\frac{1}{60}$.
Aquæ ad ℥j.

M. f. haust. To be taken three times a day. (*Landell.*)

Combination of bromide with intestinal antiseptic (to avoid unpleasant symptoms of bromism).

℞ Potassii bromidi, ʒjss.
β-naphthol, ʒj.
Sodii salicylatis, ʒss.

M. et divide in doses iij. A dose three times a day. (*Féré.*)

Prescription for the mixed bromides.

℞ Ammonii bromidi
Sodii bromidi } āā ʒijss.
Potassii bromidi
Aquæ ad ℥viij.

M. f. mist. One to two tablespoonfuls for a dose.

(*Dujardin-Beaumetz.*)

Combination of bromides and iodides.

℞ Sodii bromidi
Potassii bromidi } āā ʒiij.
Ammonii bromidi
Potassii iodidi } āā ʒjss.
Ammonii iodidi
Ammonii carbonatis, ʒj.
Tincturæ calumbæ, ℥jss.
Aquæ ad ℥viij.

M. f. mist. A teaspoonful, in water, before each meal and at bed-time.

(*Brown-Séquard.*)

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* "Diseases of Nervous System," p. 784.

Atropine and hyoscyamine pills.

℞ Atropinæ sulphatis, gr. ¾.
Hyoscyamine, gr. ⅓.
Pulveris et extracti glycyrrhizæ, q.s.

Ut f. pil. lx. One night and morning. (*Benedikt.*)

Combination of anti-epileptic remedies.

℞ Strychninæ sulphatis, gr. j.
Extracti ergotæ fluidi, ℥jss.
Liquoris arsenicalis, ʒij.
Sodii bromidi, ℥jss.
Tincturæ digitalis, ʒiijss.
Aquæ menthæ piperitæ ad ℥iv.

M. f. mist. A teaspoonful in half a tumblerful of water before food. (*Hamilton.*)

Combination of antipyrin and ammonium bromide.

℞ Antipyrin, ʒij ad ʒiv.
Ammonii bromidi, ʒiv ad ℥j.
Aquæ cinnamomi ad ℥iij.

M. f. mist. A teaspoonful three times a day. (*Potts.*)

To diminish severity and frequency of convulsions.

℞ Morphinæ sulphatis, gr. jss.
Tincturæ veratri viridis, ℥j.

M. Twenty minims hypodermically during or before a convulsion. (*Mordough.*)

For epileptic attacks following suppression of menses.

℞ Extracti nucis vomicæ, gr. x.
Pilulæ aloes et myrrhæ, ʒij.

M. et divide in pil. xxxvj. One or two twice a day. (*Copland.*)

Borax mixture for epilepsy.

℞ Boracis, ʒiij.
Glycerini, ℥j.
Aquæ ad ℥iij.

M. f. mist. (Dissolve the borax in *warm* glycerine.) A dessertspoonful three times a day. (*Finlay.*)

Stramonium and hydrobromic acid in epilepsy.

℞ Extracti stramonii fluidi (U.S.P.), ♏clx.
Acidi hydrobromici diluti, ℥j.
Syrupi, ℥j.

M. Begin with half a teaspoonful doses and continue until physiological effects of stramonium appear. (*W. C. Wade.*)

CHAPTER VII.

THE TREATMENT OF HYSTERIA AND NEURASTHENIA.

Hysteria—Symptoms (1) of Convulsive Forms; (2) of Non-Convulsive Forms—Paralyses—Contractures, etc.—Hyperæsthesia—Anæsthesia—Neuralgia, etc.—Causation—Educational Influences, &c.—*Treatment* (1) of the *Hysterical State*—Hygienic—Medicinal Treatment should be directed to the Relief of Disordered Functions—Antispasmodics—Methylene Blue—Bromides: Indications and Counter-indications for their Use—Morphine—Chloral—Hydrotherapy—Sea-bathing—Electricity and Massage—Hypnotism—(2) of the *Convulsive Attacks*—(3) of *Particular Symptoms*—Contractures—Paralysis—Aphonia—Hysterical Joints.

Neurasthenia—Symptoms—The "Rest Cure"—Indications and Counter-indications—*Anorexia Nervosa*—Methods of Applying the "Rest Cure"—Isolation—Diet—Massage—Electricity—Tonics—Schedule. Additional Formulæ.

Hysteria.

The vast number of morbid phenomena which it is possible to gather together under the common designation **hysteria** renders any attempt at a comprehensive, yet concise, account of its nature, causes, and treatment a task of some difficulty. As, however, the therapeutic side of the question is now our chief concern, we must not be expected to enter into elaborate details of the various functional disturbances, mental and physical, which a full consideration of this disease would necessitate. Since the commencement of the remarkable and minute observations of Charcot and his followers in the study of the hysterical state, and especially of those forms of hysteria grouped by Charcot under the title of *grande hystérie,* the literature of this branch of practical medicine has been enriched by a mass of voluminous contributions, the barest abstract of which would occupy a volume.

Perhaps as good a definition of hysteria as can be offered is that given by Oppenheim, who defines it as "a *psychosis*, which does not express itself by disorders of the intellect, but in defects of character and emotional disturbances, whose real nature is hidden under an almost unlimited and varied number of *physical* symptoms of disease."*

We must, in this place, confine ourselves to the consideration of those definite symptoms and manifestations which call for equally definite remedial measures, as well as of the *general* morbid condition out of which they spring.

We may conveniently divide those symptoms into (1) those of the *convulsive* forms and (2) those of the *non-convulsive* forms.

1. The **convulsive** forms include that common manifestation of hysteria—the hysterical "*fit.*" Often, after some unusual emotional disturbance attended with laughing or crying, and accompanied by a very characteristic symptom, the "*globus hystericus*," *i.e.* the feeling of a ball rising into the throat and causing a choking sensation, the patient becomes attacked with more or less violent convulsions and *apparent* unconsciousness. The convulsive movements are clonic and irregular, and usually subside quickly. They are often succeeded by emotional manifestations, by abdominal distension, and by the passage of a large quantity of clear urine. Attacks of this kind assume all degrees of severity and duration, and may be followed by great mental and physical exhaustion.

The graver forms, the *grande hystérie* of Charcot, are comparatively rarely seen in England, and would seem to be almost restricted to the Latin races. The most varied symptoms and manifestations, especially the occurrence of convulsive attacks closely resembling epilepsy, have been observed and recorded in these forms, which we have not space to detail here.

2. In the **non-convulsive** forms again we encounter an immense variety of morbid phenomena. We can only refer to the chief of these.

* "Diseases of Nervous System," p. 661.

One of the most striking is the occurrence of local **paralyses.** "There is no type or form of organic paralysis which may not be simulated by hysteria" (*Osler*). Paraplegia is more common than hemiplegia. Aphonia from paralysis of the laryngeal muscles is a common form. Mutism also occurs, but less frequently. Paralysis of the bladder is a frequent accompaniment of hysterical paraplegia.

Contractures, affecting certain groups of muscles and causing lameness and deformities, have been specially studied and described by Charcot.

Clonic and *rhythmic* spasms, leading to odd rhythmic rotatory, bending, or other movements, are not rare.

Tremors, with or without paralysis and contractures, may also be hysterical.

Disturbances of sensation are also common.

Anæsthesia, and particularly *hemi-anæsthesia*, has often been noted. The transference of loss of sensibility from one side of the body to the other, upon the application of certain metals—which, under the name of metallotherapy, was, at one time, much discussed—has proved to be capable of other explanations. *Hyperæsthetic* and *neuralgic* states are very frequent in hysteria. Increased sensitiveness in the ovarian regions and over the cardiac apex and pain in the back are frequent. Gastralgia and enteralgia are often hysterical. Morbid affections of the special senses, and especially retinal hyperæsthesia, are common.

Hysterical dyspnœa, cough, hiccough, and even hemiplegia, are occasionally met with. Vomiting, aggravated flatulence, loss of appetite (the extreme form of this, named by Sir William Gull *anorexia nervosa*, we shall consider under neurasthenic states), obstinate constipation, palpitations, pseudo-angina, flushings, and sweatings, are also frequently manifestations of hysteria. *Hysterical affections* of the *joints*, especially of the knee and hip, have long been recognised and described by surgeons.

Mental and *moral* perversions, often of the most serious nature, form, perhaps, the most distressing features of the hysterical state.

The occurrence of pyrexia and hyperpyrexia in hysteria requires further elucidation. Some very high temperatures have been reported, 108° F. to 113° F., but they have not been attended by those changes in the pulse, the respiration, and the urine which we expect to find in fever. In such instances the daily range is very wide, and the rise of temperature has sometimes been limited to one side of the body!

It was forcibly and truly said by Dujardin-Beaumetz that "hysteria, by its strange manifestations, has suppressed the word '*impossible*' from pathology," and Oppenheim truly observes there is "one characteristic of hysteric symptoms always present which serves to distinguish them: *their dependence upon and reaction to psychic influence.*"

Such, then, being a brief outline of the various manifestations of hysteria, what, we may ask, do we know of its **causation,** and does that knowledge afford us any indications for its prevention and cure?

Although cases of hysteria are occasionally observed in the male, it is undoubted that the female sex is a strong predisposing cause; the old idea, however, that it was entirely referrible to uterine disorder is no longer tenable. Hereditary predisposition is a common factor, so is alcoholism in the parent.

The age of puberty is another predisposing cause; and we may often have the opportunity of watching the wayward, emotional, uncontrollable child pass at puberty into the hysterical woman; and this and other observations give a basis for the belief that, in a considerable number of cases, sexual disturbances and morbid states of the generative organs have a causal influence. Masturbation and sexual excesses are undoubtedly exciting causes; and ovarian hyperæsthesia has been noted by Charcot and others in all the serious forms.

Race certainly appears to have great influence in the production of the severer forms; and the study of *grande hystérie* could scarcely have been carried out in England for lack of material. The more emotional and sensitive Latin races contribute chiefly to this form of the malady. Jews also are especially liable to hysteria.

Faulty educational methods have been justly believed to have much to do in developing and fostering the tendency to hysteria, and this is especially likely to be the case in the offspring of neuropathic parents. The encouragement, by undue indulgence, of personal vanity, self-consciousness, and want of self-control in children of emotional and neurotic temperament is undoubtedly a fruitful cause of hysteria. The frequent absence of any proper attention to the *physical* education of young girls, to the development of their muscular system, by suitable gymnastics and out-of-door exercises, their too close confinement to school studies in some cases, their precocious introduction to exciting and erotic literature in others, are evils tending in the same direction.

The comparatively infrequent occurrence of the graver forms of hysteria amongst country-bred girls who have been early habituated to out-of-door exercises, to cold bathing, and to wholesome habits, mental and physical, indicates clearly enough the direction that should be taken in the application of preventive measures. Home education for girls is thought by some to exercise a predisposing tendency to this disease, and so, doubtless, it does when the parents are weak and indulgent, or the mother has herself shown tendencies to hysterical manifestations; the influence of example having a powerful predisposing effect. But when home influences are good we consider it the best place for a girl's education.

Anæmic conditions and defective nutrition appear to act, in some instances, as predisposing causes; but these are states which predispose to nearly every form of disease, and which always demand remedial treatment. Hysteria, however, may often be seen to occur in the robust and plethoric, and in such cases we should look to menstrual disturbances, or conscious or unconscious sexual excitement, as frequently at the root of the attacks.

Emotional shock and mental and physical strain, such as disappointment in love, domestic unhappiness, loss of social position, anxious nursing, grief, fright, etc., are amongst the commonest exciting causes of hysteria. Oppenheim speaks of the "nerve-shattering influence of psychic traumata—the pain which man gives to man."

Finally, attacks of hysteria sometimes follow acute illnesses, accidents, and injuries; and the existence of actual disease of the generative organs often leads to hysterical manifestations.

In approaching the consideration of the **treatment** of hysteria we must bear in mind what Dujardin-Beaumetz so well expressed, viz. that "hysteria, by its very nature, escapes all precise and scientific therapeutic inductions, and for *two* reasons: *firstly*, from the preponderating part which the imagination plays in this loss of balance of the nervous functions, so that there, where the learned, conscientious, patient and devoted physician will fail, the most barefaced charlatan will easily succeed—hysteria being, in fact, the nursery of surprises and miracles; and *secondly*, because the hysterical patient loves to *deceive* those around her. . . . In short, in this neurosis everything may fail and everything may succeed."* The malady, in its origin, is essentially psychic and emotional, and *moral control*, therefore, must enter largely into its successful management.

It will be convenient to consider:

1, The general treatment of the hysterical state; 2, the treatment of the convulsive attacks; and 3, the treatment of particular symptoms.

1. Harsh treatment should never be adopted or encouraged; make the patient see that you thoroughly

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* "Clinique Thérapeutique," vol. iii., p. 141.

understand her condition, and that the remedies you propose will be carried out firmly but kindly. Demand absolute trust and confidence from her friends, and, failing to obtain this, assure them that your services are useless.

In considering, first, the **hygienic** management of such cases, we have already alluded to the need of educational precautions in the training of children with neurotic tendencies. We have referred to the importance of free exercise in the open air, riding, boating, swimming, and of suitable gymnastic training of the muscular system. All that appeals strongly to the emotional element should be avoided; "every tendency to sentimentality should be repressed"; intellectual tasks should be light and school hours short, imaginative literature should be put in the background, and interesting historical, biographical, and descriptive works should take its place. Some physicians object to the study of the piano, and especially of the organ, and we have ourselves seen numerous instances in which the cultivation of music has seemed to excite the sensuous emotions and to foster hysterical tendencies. Dujardin-Beaumetz saw a special danger in the study of the organ, and stated that he had seen much hysterical excitement provoked by it, a result to be attributed, he thought, "not only to the penetrating harmony of its sounds, but also to the movements of the lower limbs in working the pedals of the instrument." What is termed the "religious education" of such children should be approached with great caution and reserve, lest the foundation be laid of future religious ecstasy, mysticism, or melancholia, which often forms so troublesome a part of the mental manifestations of hysteria. Removal from the family circle, when the disease has actually appeared, is generally advisable.

The **diet** should be simple, abundant, and supplied regularly, and at not too long intervals, as is frequently the case in boarding-schools. All strong stimulants are best avoided, and the hysterical should not indulge in strong tea or coffee, or exciting wines and liqueurs. In some anæmic cases a little sound, red wine with water may be of use as a tonic.

In arranging the mode of life of young persons predisposed to hysteria we should remember that some form of distraction or congenial occupation is necessary, and while the excitement of an excess of social gaiety is harmful, the *ennui* and vacancy of a dull, unoccupied life are very prone to give rise to hysterical manifestation, favouring, as they do, injurious habits of introspection and self-consciousness. In Zürich and elsewhere "institutions of manual labour intended for and adapted to the treatment of such cases have lately been established."*

It is necessary to watch carefully the occurrence of the menstrual periods, which greatly predispose to hysterical attacks. That unsatisfied sexual appetite often unconsciously provokes these attacks, especially in the robust and plethoric, cannot, we think, be doubted, and it is in such instances that our advice as to the propriety of marriage is sometimes sought. When there is nothing in the antecedents of the patient inconsistent with a future of good health, and when other circumstances are not unfavourable, we should not exceed our duty in pointing out to parents that they often act injudiciously in opposing or postponing unions which, from the point of view of health, it would be wiser to permit; on the other hand, there are cases in which to counsel marriage would be, as has been well pointed out, to condemn a man to a life of trouble and misery in order to procure a benefit which is altogether problematical.

In passing on to the examination of the **medicinal** treatment of hysteria, we must state at the outset that we regard drugs simply as useful auxiliaries in the management of certain phases, and in the control and relief of certain symptoms and complications, but as in no sense directly curative of this malady. For example, preparations of iron may be valuable in removing co-existing anæmia, aperient medicines are often indispensable to relieve the very troublesome constipation which is so common an accompaniment of hysterical states, and so provocative to their continuance unless duly attended to, and astringent vaginal injections may be needed to arrest leucorrhœal discharges. Similarly all disorders of function must be sought out and relieved by appropriate *treatment*, for just as we see that in epilepsy the removal of carious teeth may lead to the cessation of epileptiform seizures, so the appropriate treatment of some local uterine or other malady will frequently be attended by great alleviation, or even entire removal, of hysterical states.

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* Oppenheim's "Diseases of Nervous System" (Mayer's translation), p. 697.

It was at one time the practice to use a variety of so-called antispasmodics, such as musk, asafœtida, galbanum, valerian, castor, etc., for the relief of hysteria. These have mostly gone out of fashion. Valerian, however, is undoubtedly useful in controlling some of the minor hysterical manifestations, and the valerianate of zinc is really a valuable remedy, especially in those forms of hysteria with hypochondriacal tendencies.

One or two grains of this salt should be given in a coated pill (to cover the unpleasant odour) after food three times a day, and in hysteria in the male, a state almost always attended with despondency and signs of nervous exhaustion, the addition of $\frac{1}{60}$th of a grain of phosphorus to each pill often acts extremely well. Fagge stated that he had found these valerianate of zinc pills "most effective in removing aphonia, hemianæsthesia, and hysterical hemiplegia." Asafœtida also has been commended, in doses of 5 grains every three or four hours.

Pitres has reported remarkable cures from the administration of *methylene blue;* such results are doubtless attributable to the patient's surprise at the effect of the drug, as it colours the urine blue. It may be given in coated pills, one or two grains for a dose.

Considerable difference of opinion exists amongst different authorities as to the value of the bromides in hysteria. French physicians, who have undoubtedly to treat many more of the severer forms of hysteria than English physicians, rely greatly on the bromides, whereas some of the latter regard them as of little use. We are ourselves convinced that they are of great value in the detailed management of hysterical cases, although we are not disposed to regard them as directly curative; and while they are, we think, distinctly indicated in certain cases, they are as clearly counter-indicated in others.

They are counter-indicated in those cases that are associated with great physical and mental depression, in those lachrymose cases dependent on troubles, worries, and anxieties, and quite independent of any sexual excitement. But even in such cases an occasional dose of sodium bromide with aromatic spirit of ammonia and chloroform water at night to relieve sleeplessness often has a very beneficial general effect.

They are indicated, and are of the greatest possible use, in the stronger and more robust patients, with much nervous agitation and sleeplessness, and with distinct evidence of sexual excitement.

Their sedative effect on the cerebro-spinal nervous system and their specially anaphrodisiac action render them most valuable calmative agents.

The mixed bromides as recommended by Charcot act best, and a dose of 20 to 30 grains may be given in a tablespoonful of chloroform water night and morning, or the night dose only may suffice.

The bromides should not be given in large doses, nor continuously; they are most useful at the menstrual periods.

Some physicians who are not favourable to the use of bromides have advocated the administration of opium, morphine, and chloral. Of the power of those drugs to quiet and calm the nervous symptoms, and to produce sleep, no one can have any doubt; but the remarkably soothing effect of opium or morphine brings with it a most dangerous craving for the drug. Hysterical, emotional patients' dread is not so much of pain or of physical discomfort as of *ennui* and weariness, and for this they find in morphine an effectual remedy; while the certainty of getting sleep from chloral, if they take it in large enough doses, brings with it also a craving for that drug.

We do not say that morphine or chloral may not occasionally be given with advantage in hysterical cases, but their administration should be reserved for the medical attendant himself, and not entrusted to the patient's friends.

It is important to be aware of the fact that hysterical patients present extraordinary differences in their sensitiveness to the action of medicines; some are remarkably affected by quite small doses, and others require enormous doses in order to produce any decided effect. They may be said to be subject to therapeutic as well as to cutaneous hyperæsthesia and anæsthesia. Oppenheim mentions the case of one of his patients who had an action of the bowels whenever she gave a dose of castor oil to her child, but when she took it herself it had no effect! Ordinary aperient drugs constantly fail with the hysterical. Cold water enemata will sometimes succeed, and so will electrical treatment combined with abdominal massage, faradisation or galvanic faradisation of the abdomen, or intrarectal electric treatment in very obstinate cases.

From *medicinal* we pass to the consideration of other methods of treatment. **Hydrotherapy,** the systematic application of baths and douches to the treatment of hysterical conditions, has been attended with considerable success.

The use of prolonged hot baths, with some aromatic plants infused in the bath, such as valerian and the blossom of the lime-tree, has proved of great service in allaying the states of nervous excitement of hysterical patients. The patient should remain in the bath, which should be maintained at a uniform temperature, for one or two hours at a time. The inhalation of the odorous emanations from these aromatic substances is believed to increase the soothing effect of the long immersion.

The application of spinal douches has been found of the greatest value in the treatment of hysteria, having, when fitly applied, not only a soothing, but also a distinctly bracing and tonic effect on the debilitated nervous system. The douches should be in the form of *spray*, and they should *never* be given *cold*, but *always warm* or tepid (80° to 85° F.), at the commencement of the treatment. After a time, alternating douches, warm and cold by turns (Scottish douche), may be given; but it is necessary to note carefully the effect on the patient, so as never to give rise to too great excitement. The douche must be given so as to avoid the patient's head, and should never last more than thirty seconds. This treatment is best carried out in establishments adapted to the purpose, such as those at Matlock, Ilkley, Malvern, Pitlochry, Crieff, etc., in England and Scotland; at Passy, close to Paris; at Champel, or Divonne, near Geneva; at Aussee, in Styria; at Gérardmer, in the Vosges; and in numerous other attractive localities. Treatment in these institutions has the further advantage of removing patients from their habitual *entourage*, and often from moral influences not conducive to their cure.

Sea-bathing has been advocated by some English physicians, but it was protested against strongly by Dujardin-Beaumetz. He stated that he had always seen sea-air and sea-baths set up a great amount of excitement, and aggravate notably the nervous sufferings of hysterical patients, and Oppenheim also remarks that "sea-baths are not well borne by hysteric individuals." We should certainly not recommend sea-bathing in well-developed hysterical states; but we should hardly be disposed to prohibit it in the case of young girls with simply a hysterical predisposition, who are fond of swimming and sea-bathing. No doubt the friends of such young persons should be cautioned against the possibility of sea-bathing causing nervous excitement, and it should be at once discontinued on any signs of this appearing.

Of the value of **electricity** and **massage** in the treatment of some forms of hysteria there can be no doubt. Jacoby* maintains that it does not cure the disease, although it may suppress, for a time, its manifestations. He observes: "Whenever such a symptomatic cure has been effected by means of electricity alone, the cure is due to *suggestion* and not to the electric current, and whenever an entire or proximate cure of the disease itself has been brought about, this has been done, not by means of electricity alone, but through a judicious employment of a combination of psychic and physical remedies. . . . The physician, in electricity, has one of the most efficient carriers of suggestion."

To the application of **hypnotism** and **suggestion** to the treatment of hysteria, we must own we look with little sympathy and less confidence. That it may produce apparently remarkable results, in many hysterical cases, is only what we should expect from the very nature of the disease. That it may replace one phase of deception, conscious or unconscious, by another is probable; but we are disposed to regard the practice of hypnotism as tending to develop rather than repress abnormal and morbid nervous manifestations. Its sphere of usefulness seems to us to be practically limited to the suppression of evil habits, alcoholism, etc., in the hysterical, and for this purpose hypnotic suggestion appears to have been of service in some cases. In most other instances, however, we should prefer, as Jacoby suggests, to use electricity as the carrier of suggestion. We shall refer to the *general* use of electricity again when we treat of the "rest cure" in cases of neurasthenia.

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* Cohen's "System of Physiologic Therapeutics," vol. ii., p. 169.

2. In the next place, we pass on to consider the **treatment** of the **convulsive attacks.** In the slighter attacks no active treatment is needed. It is only necessary to loosen any tight garments, and to place the patient on a bed or couch, and leave her *quite alone;* or she may be, when it can be done conveniently, watched without her knowledge; but of this we should be *quite sure.* Left alone, without notice or sympathy, the hysterical convulsions will soon come to an end. Free affusion with cold water is a tried remedy, and the mere mention of it will often suffice to bring the patient round. It may be dashed against the face, again and again; or the patient's head and shoulders may be brought over the edge of the bed, and cold water poured over them from a height. Another method, suggested by Dr. Hare, is to prevent the patient from breathing for a time by compressing the mouth and nose. She will soon make efforts to relieve herself from this restraint, and the strong and deep inspiration she will then make is often followed by relaxation of the spasms and the cessation of the fit. The application of strong ammonia to the nose (not, however, without care, else great irritation may be provoked) is a very useful measure, as it may often be relied upon to distinguish between epileptic and hysterical convulsions.

The threat of the application of the *actual cautery*, and preparation for that operation, has been said by Whitla to promptly lead to a restoration of calm and consciousness.

Hystero-genic zones.—In the treatment of the more severe and intractable forms, Charcot introduced the method of applying *compression to the ovary*, or rather, we should say, in the ovarian or iliac region, because it does not appear to be necessary that the pressure should be made precisely over an ovary. The closed fist should be pressed firmly and strongly into the iliac fossa, and the compression maintained for a certain time. It is remarkable that pressure over this region is capable both of exciting and arresting the convulsive attack, and this remark applies to other so-called **hystero-genic zones, as** upon the apex region of the heart.

The application of the continuous *electric* current will often diminish the duration or cut short these convulsive attacks. One pole is placed on the forehead and the other on the epigastrium, or some other part of the body. A sudden change in the direction of the poles has been found particularly efficacious in arresting the attack. The current must not be very strong, 6 to 8 or 10 milliampères being sufficient.

It has been suggested that if a hystero-genic zone be found on the skin, whence the spasm may be produced, it should be protected from all contact.

The inhalation of chloroform, of ether, or of nitrate of amyl, is an expedient to which recourse may be necessary in some cases of otherwise uncontrollable convulsions.

3. In the third place we proceed to consider the treatment appropriate to particular symptoms.

Contractures.—These are amongst the most troublesome of hysterical manifestations. They are usually accompanied by some disturbance of the cutaneous sensibility either in the form of anæsthesia or hyperæsthesia. These spasmodic contractions may appear suddenly at the end of a convulsive attack and remain till the end of another attack, when they will suddenly disappear. They may attack almost any group of muscles. In case of the existence of any doubt as to their true nature, the patient should be brought under the influence of chloroform or ether, when the contraction will disappear. Hysterical abdominal tumour is of this nature, and will disappear on the administration of an anæsthetic. Forcible compression or traction on the contracted part, and the application of induction currents, together with *appropriate treatment of the general constitutional state* on the principles already laid down, may succeed in overcoming some of those manifestations.

Weir-Mitchell * quotes an obstinate case of this kind, in which, after traction and electricity and other measures failed, a cure followed the fullest hypodermic injection of atropine that the patient could bear thrown directly into the rigid muscles. As soon as the atropine produced relaxation of the limb, it was manipulated and moved in different directions, upwards, downwards, and sideways.

Attempts to forcibly extend a spasmodically flexed limb may give rise, as Weir-Mitchell has pointed out, to general convulsions, and must, of course, then be desisted from; he also states that he has thrice seen section of the tendo Achillis prove valuable.

Paralysis of various sets of muscles, and of various sensory areas, are met with in hysterical states. Moral or coercive treatment will suffice in some cases to cure them. We once saw a case of hysterical paraplegia in a young girl, the true nature of which had not been apprehended. She had been kept in bed in hospital for six months. Chloroform was administered for diagnostic purposes, and as she passed into the stage of excitement she began to throw about the "paralysed" lower extremities. We had her, after this, got out of bed daily and placed in the middle of the ward, where she was left to find her way back to her bed; this she soon did, and in a very short time left the hospital perfectly well. There was in this case complete cutaneous anæsthesia of both lower limbs. In another case of hysterical partial loss of power of the lower limbs in a hospital out-patient, we insisted on her putting aside her crutches and walking home without them. This she did, and never used them again. Oppenheim mentions a case in which resection of the knee had been decided upon. "She came to me," he says, "on two crutches, and left me in a quarter of an hour without them"! But there are few cases so easily cured as these. The application of electricity, of massage, and of the methods of hydrotherapy is of great value in the treatment of these hysterical paralyses. Some have found putting a narrow strip of blistering plaster completely round the limb of great service.

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* "Lectures on Diseases of the Nervous System," p. 126.

Weir-Mitchell recommends massage and electricity together with careful attention to any other functional disorders that may co-exist; *e.g.* in a case of motor and sensory paraplegia, finding that the patient suffered from acid regurgitations, he put her on an exclusive milk diet containing 2 grains of sodium bicarbonate to the ounce. "Secure," he says, "to such cases a quiet, unemotional life, and with the renewal of healthy nutritive functions the sensory failures will in turn cease to exist." "The cures of those cases are to be made by a slow, steady, hopeful training of the will-powers through every-day effort, which needs some caution not to err in the way of excess . . . a case is urged and scolded, and teased and bribed and decoyed along the road to health . . . this is what it means to treat hysteria."*

Oppenheim has found the faradic brush especially efficacious against the anæsthesia, and he has also found the application of a large horse-shoe magnet or electric sparks from a static machine do good when other measures fail. For the headache, backache, and neuralgia attacks he recommends the constant current to be applied to the seat of the trouble. He has also found the wearing of an ice-bag efficacious in relieving the backache.

The treatment of a common form of hysterical paralysis needs special notice. We refer to **aphonia** from hysterical palsy of the vocal cords. These cases need general tonic and supporting treatment, and the local application of the faradic current to the larynx. One pole is applied externally over the larynx, and by means of a suitable laryngeal director provided with a button for making contact, the other pole may be applied to the interior of the larynx itself; on contact being made, the patient should be firmly commanded to make some sound such as "Ah!" or to say "One, two, three." We have often found touching the neck or face, or even the hand, with the laryngeal pole and making sudden contact, and at the same time commanding the patient to speak, answer quite as well as touching the interior of the larynx. The great trouble in these cases is the tendency to constant recurrence. A pill of 1 or 2 grains of valerianate of zinc twice a day is an excellent aid to other treatment.

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* "Lectures on Diseases of the Nervous System," p. 36.

For spasm of the glottis an emetic (apomorphine hypodermically) may sometimes have a good effect when other means fail.

The most appropriate treatment of *hysterical joints* is the application of induction currents together with massage, and the setting aside of bandages and crutches.

Gastric symptoms, and especially persistent hysterical vomiting and refusal of food, are best encountered by forced feeding by means of a funnel and tube, such as is used in the feeding of the insane, the latter being, if necessary, passed along the floor of one or other of the nasal passages into the œsophagus and stomach.

In conclusion we cannot do better than quote the words of Professor Oppenheim: "The basis of the treatment of hysteria is *psychotherapy*. The physician must betray intense interest in his patient, and must gain her confidence without losing his authority. He should not ignore any symptoms of his patient, least of all ridicule or laugh at them, but should constantly assure her of their curability; must even definitely satisfy her of this. The physician must endeavour to distract the patient's attention from her symptoms and seek to strengthen her will-power. Much can be accomplished by tact and a proper understanding of the case. He gains in this way the patient's trust and lays bare the patient's inner life, and shows her the hidden wounds which must be closed before the disease can be cured. It is often necessary to combat single symptoms which particularly trouble the patient. Most of our remedies lose their efficacy after a time, and new methods must constantly be used to win the necessary psychic influence."*

NEURASTHENIA.

Closely allied to, and in some cases almost inseparable from, hysterical states are those morbid conditions to which, in modern times, has been applied the term *neurasthenia.*

This term is made, by many authors, very comprehensive, so as to include a great variety of morbid manifestations ranging from the confines of hysteria to the border-land of insanity, and including also under the designation "*traumatic* neurasthenia" all those nervous states which follow "shock," as in railway and other accidents.

This condition of the nervous system is characterised by a combination of exhaustion, or feebleness, and irritability. The symptoms most commonly complained of are sleeplessness, great *muscular debility,* headache and backache; dyspepsia, with loss of appetite, and constipation; mental weariness, incapacity and unrest, and an irritable, capricious, uncontrollable temper.

Less constant but frequent symptoms are anæmia, cardiac and vaso-motor excitement, palpitations, sweatings, etc., spinal hyperæsthesia, vague erratic pains, and ovarian tenderness, with other sexual disturbances in both sexes; and in some cases we may encounter also all the symptoms which characterise the hysterical state.

The field of morbid phenomena occupied by these cases is extremely vast, and the literature of the subject as extensive as it is interesting, for owing to the absence of any known and constant *physical* basis to which to refer the manifestations observed, it is sometimes, perhaps, a little difficult to distinguish between romance and reality in the written descriptions of this many-sided malady.

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* *Op. cit.*, p. 697.

Some authors divide cases of neurasthenia into groups or classes, such as (*a*) the cerebral form, (*b*) the spinal, and (*c*) the cerebro-spinal form,* or according to another author into (*a*) cerebral, (*b*) spinal, (*c*) cardiac and vaso-motor, (*d*) gastro-intestinal, and (*e*) sexual forms,† besides the traumatic group.‡ Oppenheim § thinks these divisions "artificial" and "not practicable," and we are disposed to agree with him. They serve rather to group symptoms than cases.

As to the *etiology* of neurasthenia, all are agreed that *heredity* stands in the first place—the inheritance of a neurotic constitution; and next in order is stress—mental, emotional, or physical strain.

It is a question whether some cases following infective fevers, or associated with gastro-intestinal disorders, do not arise from some obscure *toxic* agency. Sexual vices or aberrations, such as masturbation, etc., are common in the neurasthenic, and certainly aggravate if they do not cause this malady. The effect of physical injury when combined with shock—or shock even without physical injury—as in railway accidents, will give rise to the "traumatic form."

It is in certain cases of this disease that the "**rest cure**," devised by Weir-Mitchell, has proved so remarkably successful. But there can be no sort of doubt that it has been applied far too indiscriminately, and that for this, as indeed for any special method of treatment, a careful selection of suitable cases is needful. There are also many great drawbacks to the application of this method; it involves, for a time, complete separation from family ties, and very costly nursing and medical attendance. It is unsuited to the hypochondriacal, for whom forced inactivity is most prejudicial; these rather need enforced activity, with change of scene and environment.

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* Garrett Anderson, "Encyclopædia Medica," vol. viii., p. 328. Art. Neurasthenia.

† Clifford Allbutt, "System of Medicine," vol. vii., p. 134. Art. Neurasthenia.

‡ Victor Horsley, Allbutt's "System of Medicine," vol. vii., p. 164.

§ "Diseases of the Nervous System," p. 714.

The cases that are especially adapted to the rest-cure are those that Sir William Gull described as cases of *anorexia nervosa* or *hysterica*, in which we find absolute loss of appetite and loathing of food, with quite a phenomenal amount of emaciation. Other suitable cases are those with great loss of moral tone, and a morbid desire for sympathy and attention. Certain distressful mental conditions originating in family worries, in love troubles, or in religious excitement are also often greatly benefited by this method of treatment. It suits women, for obvious reasons, much better than men. Many of these neurasthenic cases originate in a hasty return to the strain and effort attending domestic and social duties after incomplete convalescence from some severe illness; or they arise in a struggle between a mistaken or exaggerated sense of duty, and the physical or mental inability to cope with its demands; or the distress of some unrelieved chronic disease is concealed and is neglected until a serious state of physical and moral debility is induced.

The **"rest cure"** comes to the relief of many of these otherwise intractable cases. The means it employs are isolation, rest in bed, passive exercise, electricity, and a rigidly ordered diet. Women are advised to begin treatment immediately after a menstrual period.

The **isolation** must be very complete. Removal from home and family is essential; no sympathetic relative or acquaintance must be seen; no letters are to be sent or received; and for the purpose a private hospital or home is the best. The only persons allowed to see the patient are the doctor, the nurse, and the masseuse. The nurse should be young and previously unknown to the patient. She must be observant, educated, intelligent, tactful, conciliatory, and discreet. If a nurse does not get on well with the patient she had better be at once changed. The duration of the seclusion must be from six to eight weeks in milder cases, while many months may be needful in more inveterate forms, especially those complicated with hysteria. Towards the end of the period some of the rules may be somewhat relaxed, and a limited number of short letters may be written and received. "Isolation is not a matter of weeks and months, but of results. The results which we desire to obtain are to separate the patient from the habits of long illness, from the too tender solicitude of her family or friends, to restore the enfeebled will-power and strengthen the *morale*, and make the invalid once more able to bear her part in every-day life."*

The amount and strictness of the **rest** must be adapted to individual requirements. When there is evidence of great cerebro-spinal exhaustion, the rest must be most absolute, even to the extent of not allowing the patient to feed herself or to turn herself over in bed. No conversation is allowed. Thus absolute inactivity is assured to the over-strained nerve-centres. As improvement becomes manifest, some relaxation of this rule may be permitted; the patient may sit up in bed for her meals, and after five or six weeks she may sit for ten minutes twice a day in a chair while her bed is being arranged. This sitting-up period is increased gradually to an hour twice a day. A little walking exercise may now be permitted. After ten days a short drive may be taken, the patient being carried in a chair up and down stairs and to the carriage. As some hysterical patients rather shirk this return to relative activity it must be firmly insisted on. After complete recovery, a certain amount of absolute repose daily should be ordered, as an hour after each meal.

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* "Rest Cure for Neurasthenia," by J. K. Mitchell, M.D. Hare's "System of Practical Therapeutics" (second edition), vol. i., p. 286.

As to **diet.** In cases of entire loss of appetite, or *anorexia nervosa*, it is best to begin with an absolute milk diet. Skimmed milk only should be used, and at first in quite small quantities at a time. As soon as tolerance of the diet is established, 4 ounces, warm or cold, increasing to 8 or 10 ounces, should be given every two hours.* After four or five days of milk diet a chop is ordered at noon, and the next day, in addition, some bread and butter at supper. Some slight increase of these two meals is slowly made for a few days, and then some more food is given for breakfast. If the patient is digesting well, she soon gets to three full meals a day, and about two quarts of milk. A portion of this milk may then be replaced by some suitable and agreeably prepared and pre-digested food.

Systematic **massage** is another most important part of the "rest cure." It should begin with the first two days of confinement to bed, and should at first consist of "gentle stroking of the whole body for from 15 to 20 minutes, for two or three days, then going on to thorough deep massage of the entire surface of the body and limbs, exclusive of the head and neck, and be rapidly increased in duration to an hour, or an hour and a half, daily." It is, of course, important that the massage should be properly performed; the best test of this "is the patient's power of consuming and digesting food," but if "the patient's weight increases with abnormal rapidity, either the massage is not sufficiently thorough" or the diet needs modifying. A deposit of lithates in the urine must also be regarded as evidence that the patient fails to utilise the amount of food taken. Thorough massage of the abdomen is especially desirable in view of the frequency of obstinate constipation in these cases.

Electricity is, according to Weir-Mitchell, the least necessary part of this treatment. A slowly interrupted mild faradic current should be used to the muscles once a day, going all over the body; this produces slight contraction of each muscle and distinctly raises the patient's tone. "After the daily faradisation of the muscles has been completed, in cases in which the spinal centres seem affected the use of the rapidly interrupted current through the spinal cord does good, placing one pole on the nape of the neck and a large electrode on the soles of both feet" (*Mitchell*). This should last for fifteen minutes.

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* Some further minor details will be found in the author's "Food in Health and Disease" (new edition), p. 466.

A combination of electricity and massage leads to excessive waste of tissue; it also leads by promotion of digestion and circulation to improved assimilation, so that an excessive amount of food can be consumed to make up for this waste. The final outcome is a great acceleration of tissue changes.

Should any signs of dyspepsia occur during the excessive diets, it should be met by a return to the absolute milk diet for a day or two.

In addition to these measures, good may be obtained from the use of certain medicines to fulfil definite indications. Mitchell recommends in anæmic cases that large doses of the pyrophosphate or lactate of iron, 5 to 20 grains, thrice a day, should be dissolved in the malt extract, as much as 3 ounces of which may be given at each meal; he also proposes a cheap substitute for malt extract, made by adding a teaspoonful of dry malt to 3 ounces of good brown stout.

During the "rest cure" certain troubles may need special treatment. Insomnia may at first need a few nightly doses of some hypnotic to break through the habit of sleeplessness, and sulphonal is, perhaps, the least objectionable. This drug must either be given an hour or two before you desire to induce sleep, 5 or 6 grains every half-hour, or, if *prompt* action is wished for, it is best given in a full dose, 15 to 30 grains dissolved in boiling water and drunk as hot as the patient can swallow it. Trional also is suitable in doses of 15 to 30 grains. Or the "drip-sheet" may be applied if there is restlessness at night. For the management of the often troublesome *constipation* the reader is referred to what has already been said under that head. Swedish movements are frequently of value in leading the patient again gradually to a life of free muscular exercise. The means of restoration to health, here described, must, during convalescence, only be slowly and gradually quitted, and they will be found, in most cases, to be needed, in a diminished and modified degree, for some time. From six weeks to three months may be taken as the average time needed for this cure. Change to the sea, the mountains, or to the country, in suitable seasons, will be of advantage in confirming the cure. But this "rest" cure is, as we have pointed out, only applicable to a limited group of cases, and its cost makes it impossible for many. We must therefore add some more general directions.

The physician is rarely able to apply *preventive* measures, but if he were they would be of the nature already suggested in what we have said about the training and education of children prone to hysteria. "Everything which strengthens and hardens the young body serves as a protection to the nervous system. Everything which overburdens the mind, stimulates the senses, excites the imagination, arouses the emotions, weakens the body and prepares the way for neurasthenia. Above everything else, however, a backward child should not be forced to study. The child should be guarded and cautioned against masturbation."* If possible, an out-of-door occupation should be sought for such children, and agricultural pursuits are most suitable.

Entire withdrawal from work and enforced inactivity act unfavourably on certain introspective natures. It is better that such a patient should have some employment which shall divert his mind from dwelling on his morbid sensations. "Work," says Oppenheim, "in accordance with his capacity and in proper dosage is a therapeutic remedy of priceless value." In cases dependent upon masturbation it is important, while pointing out clearly the dangers attending this habit, not to *over*-alarm the patient or cause him to take too serious a view of the effects on his constitution—we have known the most disastrous consequences follow such alarmist though well-meant cautions.

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* Oppenheim's "Diseases of the Nervous System," p. 717.

With respect to *drug* treatment, there is something like a general consent amongst physicians of experience in these cases that *arsenic* is of special value. Clifford Allbutt considers it "invaluable" in gastric cases. It should be given in small doses at first and gradually increased up to 5 minims of Fowler's solution thrice daily after meals, and continued for three or four weeks. It may be combined with small doses of iron in anæmic cases. *Valerian* in the form of the ammoniated tincture or combined with zinc—valerianate of zinc in 2-grain pills twice or thrice daily—proves of much service in many cases. The *hypophosphites* and the *glycerophosphates* of soda and lime are undoubtedly serviceable in some cases; so is a combination of *phosphorus* (gr. $\frac{1}{60}$) and valerianate of zinc (gr. ij.).

The *bromides* are of great service in very many of these cases, if given carefully and with judgment, not continuously, but with interruptions. They may be usefully combined with valerian and nux vomica. Sodium bromide in 15- or 20-grain doses, if given at bed-time, with 60 minims of tincture of hops or 30 minims of tincture of henbane, will often relieve the milder forms of insomnia. We must remember that some of these patients are easily depressed by bromides, especially those suffering from great muscular exhaustion; these must therefore be prescribed with caution.

Severe attacks of pain, especially of gastralgia, may require an occasional opiate, but we should be very chary in the use of this drug in neurasthenia.

Symptoms of auto-intoxication, from the absorption of toxins from the alimentary canal, point to the need of a mild calomel and saline purgative (the bowels should always be kept freely open), and some intestinal antiseptic, such as a menthol, thymol, or creasote pill, taken after meals. Great care in diet is also needed in these *toxic* cases. Complex meals should be avoided, and great simplicity in the choice of food and the avoidance of excess insisted upon.

Hydrotherapy is of great service in many of these cases, and should be applied in one of the many institutions devoted to this method of treatment, and under the direction of a physician experienced in the management of such cases. It is especially suited to those patients who are not likely to be benefited by isolation and enforced inactivity. The nature and mode of application of the baths, sprays, and douches must be adapted to individual cases at the discretion of the physician in charge.

Appropriate exercises may also be combined with this treatment. Mrs. Garrett Anderson has found it "well worth while to prescribe three or four daily short douches of the neck and face with water of 105° F. or more, and to order the feet to be put into still hotter water for two or three minutes twice a day perhaps, in the afternoon and at bed-time. As the case improves, the morning douching may be done with moderately cold water, till in the end the patient is taking a sitz-bath every morning of 60° F. and a quite hot sitz-bath every night."* We have already alluded to the use of *electricity* in connection with the Weir-Mitchell treatment, and apart from this method it may be employed to good purpose in the treatment of neurasthenia. General electrisation, avoiding strong currents, should be used. "Moderate stimulation of the peripheral nerves being all that is necessary, . . . the symptoms of cerebral and spinal irritation are not infrequently aggravated by the use of strong currents."* At first such application should not be for more than five to ten minutes. After six weeks the treatment should be stopped for six weeks, and then renewed for another six weeks. "The electrostatic bath, the *localised breeze and spray* applied to single parts, especially to the head and spine, will be found useful." The faradic bath is also serviceable. "The feelings of pain in the back and extremities are best treated by means of stabile spinal galvanisation." Jacoby speaks highly of the "head breeze in neurasthenic insomnia," which he has found succeed when "all other forms of electric application have failed."

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* *Encyclopædia Medica*, vol. viii., p. 338.

For further details as to the treatment of *insomnia* the reader is referred to a previous chapter.

Climate and *spa* treatment are often of much service in certain cases—partly for the change of scene and mode of life they bring, as well as for the opportunity they afford of being much in the open air.

Over-stimulating climates will need to be avoided, as they often aggravate the insomnia and nervous restlessness; the high altitudes are therefore not to be recommended, and resorts close to the sea often prove too exciting. Moderately bracing forest or woodland districts, with pleasing scenery, are most suitable. The indifferent thermal spas, such as Gastein, Buxton, and Schlangenbad, have been found of service.

The *traumatic* cases—especially those following railway accidents and purely neurasthenic—*i.e.* uncomplicated with any physical injury—require much the same kind of treatment as we have already described, the Weir-Mitchell *rest* cure being specially suitable for such cases.

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* Jacoby, "Electrotherapy," vol. ii. of Cohen's "System of Physiologic Therapeutics." This author truly observes (p. 179): "Under all circumstances should it be remembered that fresh delusions may easily be implanted upon a physically disordered brain, and electricity is one of the agents most capable of doing so."

Finally, it must never be forgotten that in the management of these cases, as in cases of hysteria, the *personal* factor is a most important one. These patients are highly impressionable, often querulous and critical and not rarely suspicious; the personality of the physician, therefore, tells largely for or against success. He must aim at attaining a wholesome ascendency through a combination of insight, sympathy, and firmness.

SCHEDULE OF FULL "REST TREATMENT."*

MISS A. B. :—

7 a.m. Cocoa. Cool sponge-bath with rough rub and toilet for the day.
8 a.m. Breakfast with milk. Rest an hour after.
10 a.m. 8 oz. peptonised milk.
11 a.m. Massage.
12 noon. 8 oz. milk or soup. Reading aloud by nurse half an hour.
1.30 p.m. Dinner. Rest an hour.
3.30 p.m. 8 oz. peptonised milk.
4 p.m. Electricity.
6.30 p.m. Supper with milk. Rest an hour.
8 p.m. Reading aloud by nurse half an hour.
9 p.m. Light rubbing by nurse with drip-sheets.
3 oz. malt extract with meals; tonic after meals.
8 oz. peptonised milk with biscuit at bed-time, and a glass of milk during the night if desired.
Laxative (cascara), 10 to 30 drops occasionally.
Later, Swedish movements are added after the massage.

ADDITIONAL FORMULÆ.

Mixture in hysterical attacks.

℞ Tincturæ valerianæ ammouiatæ, ℥ss.
Spiritus ætheris compositi, ℥ss.
Tincturæ lavandulæ compositæ, ℥ss.
Tincturæ hyoscyami, ♏clx.
Aquæ camphoræ ad ℥xij.
M. f. mist. Three tablespoonfuls every two or three hours. (*Ashwell.*)

Pills for hysteria.

℞ Extracti hyoscyami, gr. xij.
Extracti valerianæ } āā
Zinci oxidi } gr. xxv.
M. et divide in pil. l. One or two for a dose.
(*French Codex.*)

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* From J. K. Mitchell's article in Hare's "System of Practical Therapeutics" (second edition), vol. i., p. 298.

Pills for hysteria.

℞ Gummi camphoræ } āā ʒjss.
Asafœtidæ }
Extracti belladonnæ, gr. xx.
Extracti opii, gr. viij.
Gummi acaciæ et syrupi, q.s.

Ut f. pil. lx. One to six pills daily, gradually increased. (*De Bregne.*)

Drops for hysteria.

℞ Tincturæ asafœtidæ, ʒiv.
Tincturæ castorei, ʒiij.
Tincturæ opii, ♏xxxvj.

M. f. tinctura. Fifteen to thirty drops in water for a dose twice or thrice daily. (*German Pharmacopœia.*)

Enema for hysteria.

℞ Extracti valerianæ, ʒijss.
Camphoræ, gr. xij.
Vitelli ovi unum.
Tincturæ opii, ♏xij.
Aquæ ad ℥x.

M. f. enema. (*Bourdon.*)

Pills for hystero-epilepsy.

℞ Cupri sulphatis, gr. ⅛.
Argenti nitratis, gr. vj.
Zinci valerianatis, gr. iij.
Extracti belladonnæ, gr. j.
Extracti glycyrrhizæ, q.s.

Ut f. pil. xx. A pill three times a day after meals. (*Benedikt.*)

Pills for hysterical globus.

℞ Asafœtidæ, gr. lxxv.
Extracti valerianæ, gr. xxx.
Extracti taraxaci, q.s.

Ut f. pil. lx. Two pills daily. (*Bamberger.*)

Drops for the same.

℞ Tincturæ valerianæ ætheræ, ℥ss.
Spiritus ætheris nitrosi, ʒiij.

M. Fifteen drops in water three times a day. (*Bamberger.*)

Tonic pills in hysteria.

℞ Ferri sulphatis, gr. xxxvj.
Sodii bicarbonatis, gr. xxx.
Extracti valerianæ, gr. xxiv.

M. et divide in pil. xxiv. Two pills twice a day.

Pills for hysteria.

℞ Zinci valerianatis, gr. xxiv.
Quininæ valerianatis, gr. xxiv.
Ferri valerianatis, gr. xxiv.
Extracti aloes aquosi, gr. xij.

M. et divide in pil. xxiv. One three times a day after food. (*Whitla.*)

Arsenic and iron mixture in neurasthenia with anæmia.

℞ Sodii arsenatis, gr. ¼.
Ferri et ammonii citratis, gr. lxxx.
Spiritus ammoniæ aromatici, ʒij.
Aquæ ad ℥viij.

M. f. mist. A tablespoonful in water three times a day after meals.

Valerian mixture in neurasthenia.

℞ Tincturæ valerianæ ammoniatæ, ʒiv.
Tincturæ sumbul, ʒij.
Spiritus chloroformi, ʒjss.
Aquæ ad ℥viij.

M. f. mist. An eighth part twice or thrice daily.

Part VIII.

CONSTITUTIONAL DISEASES.

CHAPTER I.

THE TREATMENT OF CHRONIC RHEUMATISM AND OF RHEUMATOID ARTHRITIS OR OSTEO-ARTHRITIS.

SIMPLE CHRONIC ARTICULAR RHEUMATISM—Mode of Origin—Relation to Acute Attacks—Exciting Causes, Cold and Wet—Characteristic Nature of Anatomical Changes—Symptoms—Sub-febrile Form. *Indications for Treatment*—1. *Local* Treatment—Counter-irritation—Friction and Movements—Iodine—Paquelin's Cautery—Stimulating Liniments—Hot Water and Vapour Douches—Analgesic Applications—Sulphur—Ichthyol—Electricity—Massage—Hot Baths—"Indifferent" Thermal and Sulphur Springs—Hydrotherapy—Super-heated Air—Electric Light and Heat. 2. *Internal* Treatment—Salicylates—Alkalies—Aperients—Potassium Iodide—Colchicum—Guaiacum—Sulphur—Iron—Arsenic—Treatment of Complex Cases. 3. *Hygienic* Treatment—Food—Beverages—Clothing—Dwellings—Climate.

CHRONIC MUSCULAR RHEUMATISM (Myalgia)—Nature—Symptoms—Lumbago—Torticollis—Pleurodynia—*Treatment*—Rest—Dry Heat—Counter-irritation—Vapour and Hot Baths—Massage—Anodyne Liniments—Methyl-Chloride—Internal Remedies—Diaphoretics—Salicylates—Alkalies—Methyl-salicylate—Ammonium Chloride—Morphine Hypodermically—Acupuncture—Various Modes of Treatment adapted to different Chronic Cases.

ARTHRITIS DEFORMANS, OR OSTEO-ARTHRITIS, OR RHEUMATOID ARTHRITIS—Anatomical Characters—Acute and Chronic Form—Symptoms—Etiology—Infective Origin—Divergent Views as to Curability and Treatment, and of Baths and Massage—Therapeutic *Indications*—Thermal Treatment—Electricity—Counter-irritation—Iodine—Friction—Internal Treatment—Salicylates—Iodine and Iodides—Sedatives—Tonics—Iron—Arsenic—Quinine—Cod-liver Oil—Dietetic and Hygienic Treatment.

CHRONIC RHEUMATISM.

So much difference of opinion exists as to the precise pathological nature, affinities, and appropriate nomenclature of certain chronic, painful conditions of joints, that it is somewhat difficult, in approaching the subject from the therapeutic point of view, to make it perfectly clear what are the morbid states, or better, what are the particular cases, we are contemplating.

The disease known as acute rheumatism has been, by almost general consent, transferred to the class of acute infective diseases, and its probable microbic origin generally accepted. The term *chronic* rheumatism, as it is commonly understood, can therefore be scarcely regarded as indicating a *chronic* form of the same disease. Our own experience is entirely in accord with Osler's statement that chronic rheumatism is an extremely rare sequence of acute rheumatism, and it seems to us quite justifiable to regard these rare occurrences as coincidences, and not as causally related. There is no kind of reason why a person who has been the subject of the disease known as acute rheumatism should not later on be attacked by a chronic joint affection, such as that to which the name chronic rheumatism is generally given. But the word "rheumatism" has entered so largely into the language of the people, as well as that of the medical profession, and more particularly in connection with those cases which are termed chronic, that it would be most inconvenient to discard it. We shall therefore continue to employ it in its usual signification.

Chronic rheumatism may be **articular** or **muscular**, and it is to the treatment of the articular form that we propose first to direct our attention. It is undoubtedly difficult to define, with precision, the pathological and clinical characters of this affection, and to separate it from certain other chronic diseases of joints. We may first explain what we do *not* include under chronic rheumatism. All purely *gouty* inflammations of joints, and all cases of true osteo-arthritis, or arthritis deformans, we exclude; and we still think there is left a large class of chronic joint affections which may, at present, be distinguished by the name of chronic rheumatism; and, as a further qualification, we would call this affection *simple* chronic articular rheumatism.

Many French authors are dominated by a *general* conception of the existence of "arthritism," that is, an inherited diathesis or constitution which determines a tendency to arthritic affections generally, and to which they refer diseases differing so widely as acute gout and arthritis deformans, which, however, they trace to a common origin or diathesis, and between which they see a pathological affinity.

It will appear that the appropriate therapeutic management of those different forms of arthritis differs considerably.

Simple chronic articular rheumatism is most commonly a chronic disease from the commencement, but occasionally, though comparatively rarely, it appears to follow an attack of acute or subacute rheumatism, and more frequently the latter. In such instances, one or more joints do not return to their natural, painless, and healthy functions, but remain subject to more or less pain on movement, although there may be little or no swelling. In other instances, although the chronic joint affection does not immediately follow an acute attack, yet the *tendency* seems to be referrible to a former attack of acute rheumatism which has left behind a rheumatic predisposition; and there is also a well-marked *inherited* liability to such affections in the members of certain families. The most common exciting cause is exposure to cold and wet; it is on that account a very frequent disease amongst the hard-working poor, especially those who have to work in a damp atmosphere. But it is also met with very frequently in the upper classes, where its hereditary character is well established. Many who suffer from this complaint in a cold, damp climate, obtain complete freedom from their sufferings in a warm and dry climate. A characteristic distinction of this disease is its tendency to attack only one or a very few joints, and, although so chronic in its nature, to cause but little anatomical change in the joints affected—a slight injection of the synovial membrane, perhaps a little effusion, and some thickening of the capsule and ligaments, and adjacent sheaths of tendons. Such are the only anatomical changes in the majority of cases; and under appropriate treatment these changes will, again and again, entirely disappear.

In old cases some erosion of the cartilages is occasionally found, and in affections of single joints some muscular atrophy may occur, but more or less muscular atrophy must naturally follow when a joint goes out of use, as it were, because of the pain attending its movements.

The **symptoms** of chronic articular rheumatism are pain and impaired mobility of the joint. The pain is aggravated by movement, by unfavourable changes of weather, and sometimes paroxysms of pain occur at night; there is usually some tenderness of the joint on manipulation, and we can often detect a distinct crackling or crepitation in it. There may be no swelling of the joint, or the swelling may be only apparent from atrophy of surrounding muscles, but at other times the joint may be more or less swollen from increase of synovial fluid. Another characteristic of cases of this kind is that the stiffness and pain often completely disappear with active or passive movements of the joint.

There is danger in some of these cases, especially if neglected, that anchylosis and deformity may occur, and that the general health may suffer from the enforced inactivity involved.

There is a form of so-called chronic rheumatism which consists, in reality, of repeated attacks of *subacute* rheumatism, and is accompanied by a certain amount of fever, a quick pulse, perspiration, and high-coloured urine, together with progressive emaciation and loss of power. Those are the most hopeless cases of all to treat.

The **indications** for **treatment** in this disease are (1) to relieve the pain, (2) to restore free movement to the joint and prevent muscular atrophy, (3) to remove if possible the morbid constitutional state on which the local disease depends, (4) to improve the general tone, and (5) to adopt a *régime* of life which may prevent the re-development of the constitutional tendency.

The measures at our disposal in order to respond to these indications may be thus classified :—

1. Local and external treatment.
   (*a*) Counter-irritants, anodynes, and other special agents, (*b*) electricity, (*c*) massage and movements, (*d*) baths, douches, and heated air.
2. Internal and medicinal.
3. Hygienic and regiminal.

1. The great value of *counter-irritation*, or "revulsion," in the treatment of chronic rheumatism has been long established.

Flying blisters, in early cases, are of great use in commencing the treatment. Small blisters about the size of a florin, kept on from two to four hours, should be moved freely about over the circumference of the joint, the object being to produce general injection of the skin rather than a blister; the joint being at the same time enveloped in cotton-wool. After a few days of this treatment, and when those parts of the surface that have been blistered are healed, gentle friction twice daily with the linimentum potassii iodidi cum sapone, and gentle passive movements, should follow. Unless the joint is hot and tender these movements should be steadily increased in extent.

The application of the linimentum iodi will frequently produce a blister, and is a very useful form of counter-irritation; a mixture of equal parts of the liniment and of the tincture of iodine is, however, a more convenient strength, especially when the application is entrusted to the patient, as it can be applied for a longer time and the revulsive effect therefore maintained. The cuticle usually comes off after a few daily applications, and then the iodide of potassium liniment can be applied instead. Osler recommends the use of Paquelin's cautery as a counter-irritant. Many forms of stimulating liniments are used with advantage in slighter and more chronic cases. The following is a useful form :—

℞ Linimenti camphoræ compositi ... ...
Linimenti sinapis compositi ... ... } āā ℥j.
Olei pini sylvestris... ... ...
Misce, fiat linimentum. To be rubbed in twice a day, and the joint packed with cotton-wool.

When there are decided signs of effusion, the following combination may be applied, spread freely on long strips of lint, and maintained in contact with the joint by a close-fitting flannel bandage.

℞ Linimenti hydrargyri ... ...
Linimenti potassii iodidi cum sapone ... } āā ℥j.
Misce, fiat linimentum.

Niemeyer states that he has found a *powerful hot douche* one of the most efficient of revulsives, causing a hyperæmia of the skin lasting several hours. Vapour douches are also used in bathing establishments for this purpose.

When there is much pain in the joint, anodyne applications must be applied for its relief. Of these there are many: Equal parts of chloroform and belladonna, or of chloroform and opium liniments, are as good, perhaps, as any. After a hot douche, either of these may be applied on lint (saturated) and the joint enveloped in cotton-wool. Equal parts of veratrine ointment and chloroform liniment rubbed up together make a suitable application. Liniments containing menthol and aconite are also used.

The external application of *sulphur* is said by some authorities to have a special virtue in the relief of chronic rheumatism. The sublimated sulphur is rubbed in over the surface of the joint and adjacent skin, and some of it is also sprinkled over a layer of absorbent cotton-wool, which is then applied round the joint and fixed by a thin flannel bandage. At the same time, in order to obtain the full effect of the sulphur medication, a small teaspoonful of confection of sulphur may be taken night and morning or a sulphur tabloid three times a day immediately after food. This treatment should be persevered in for two or three months at a time. *Ichthyol* lanoline ointment (50 per cent.) has been found of value in the relief of chronic rheumatism; after washing with hot soap and water this ointment is well rubbed twice daily into the affected joint, which is then wrapped up in cotton-wool. Ichthyol contains sulphur, and is thought by some to act in the same way, and, like sulphur, it is also prescribed internally in capsules in these cases (5 to 10 grains). A somewhat weaker ointment (30 per cent.) has been found to relieve the swollen and inflamed joints in subacute cases. There is no doubt that the friction and passive movements used in applying many of these remedies contribute greatly to the good results obtained.

Next as to the value of **electricity**: some consider it of not much use in the treatment of chronic articular rheumatism; others, however, set great store by it, especially when combined with other treatment. Its use has been found to be attended by a subsidence of the pain, and a disappearance of the peri-articular thickening and exudation, as well as by an improvement in the nutrition of the wasted muscles. Jacoby* recommends "strong currents to be passed through the affected joint in all directions by means of a large well-moistened electrode. *Labile galvanic* and *faradaic* application should be made to the surrounding tissues." The galvano-*faradaic* current he thinks best for treatment of the surrounding muscular atrophy. He agrees that the treatment of such cases must be very protracted, but that "we can accomplish more by the aid of electricity than without such help."

Massage *and systematic* **movements** of the affected joints play, perhaps (together with hot baths), the most important and efficient *rôle* in the cure of chronic rheumatism. Quite remarkable results are obtained by the long and patient employment of these methods, especially when combined with hot baths and douches; the swelling of the joint is reduced, anchylosis prevented, muscular atrophy checked, and often free movement of the limb restored.

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* Electrotherapy, in Cohen's "System of Physiological Therapeutics," vol. ii.

The prolonged and systematic employment of **hot baths** has long been one of the most popular and universally recognised methods of treatment of chronic rheumatism, and since it has become the custom to combine with the use of the bath the application of massage and passive movements, even better results are now obtained.

The thermal springs chiefly resorted to for the cure of chronic rheumatism are the *indifferent* thermal baths, such as Bath, Buxton, Wildbad, Gastein, Ragatz, Schlangenbad, and Plombières; or the hot *sulphur* baths, such as Aix-les-Bains, Aix-la-Chapelle, Baden in Switzerland, Harrogate, and Strathpeffer (where the springs are heated artificially); or the hot salt and brine baths such as Droitwich (water artificially heated), Nauheim, Bourbonne-les-Bains, Wiesbaden, Baden-Baden, and many others; or the pine baths and various kinds of mud baths, such as are obtained at Homburg, Marienbad, Dax, Saint Amand, Néris, Bormio, and elsewhere (at Strathpeffer peat baths are used). Seeing how various is the composition of the hot mineral springs that have attained an equally great reputation for the cure of chronic rheumatism, there can be little doubt that the chief curative agents are the high temperature of the bath, the prolonged immersion, and the skilful and judicious combination of douches, massage, passive movements, and electricity which the physicians at these various stations employ.

The Scotch douche, that is, alternate streams of hot and cold water rapidly and briefly applied, has been found most serviceable in many cases of chronic articular rheumatism. Very hot baths are rarely now used, unless in exceptional cases. The best temperature is one ranging between 95° and 102° F. About thirty consecutive baths are usually given in average cases, and then a rest is desirable, and after a few months, in obstinate cases, the course may be resumed. The duration of the bath, the temperature of which should be maintained uniform, is usually about half an hour, but towards the end of the course many bath-physicians increase the duration of the bath even to an hour. Turkish or Russian vapour baths are not found so serviceable in this malady as warm-water baths. After a bath the patient should be wrapped in a flannel dressing gown, and allowed to rest on a reclining-couch for half an hour or an hour.

Drinking the water at these thermal baths is quite a secondary matter. In some spas, as at Gastein, there is practically no mineral water drunk; at others, the bath-physicians think drinking useful, either to keep up the action of the skin started by the bath, or for the eliminative and cleansing effect of the free consumption of water. Some believe that by drinking the water, especially the salt and the alkaline-saline waters, change of tissue and the absorption of exudations are promoted and the general nutrition improved.

Hydrotherapy, unless limited almost exclusively to the application of hot or warm water, is not suited to old chronic cases, but in recent cases a careful and cautious application of hydrotherapy may prove very useful, as by hardening and improving the tone of the skin the sensitiveness of the surface to external impressions of cold and damp may be greatly diminished. For the same reason it is often advantageous, after a cure at a thermal spa, for the patients to pass a few weeks in a dry, bracing, sub-alpine resort, or at the seaside, where a daily spray-bath, of moderately cold water, followed by brisk friction, may prove restorative of muscular and nervous tone and vigour.

The only counter-indications of thermal treatment are advanced age, and the presence of renal or arterial degeneration, or considerable circulatory disturbances.

In recent years methods have been devised, and largely adopted, of applying super-heated air locally in this and other painful affections of the joints, and they have also been treated by submitting them to both the *light* and *heat* developed in the *electric* arc. In many cases great relief has been experienced, but it has not always been permanent. In the *Tallerman* method the heat is obtained from gas, and the limb, suitably covered, is exposed to a high temperature in a sort of gas oven.

In the *Dowsing* method for the employment of *luminous radiant* heat the heat is *radiated* from specially constructed incandescent electric lamps and reflected on to the part to be treated ; a temperature up to 500° F. can thus be obtained.

In the *Greville* system, which has been widely adopted, the thermal electric rays only are used.

2. *Internal* medication has a very limited application in the treatment of simple chronic articular rheumatism. Salicin and the salicylates have little influence over these cases. They may be of use in the subacute form, or when a chronically inflamed joint becomes hot, tender, and painful ; but in the typical chronic form of articular rheumatism we are now considering, they are of little avail. No possible harm can, however, arise from trying them for a few days. Brandis of Aachen advocates the use of sodium salicylate, in very large doses, while taking a course of the sulphur waters, but we are by no means convinced that this practice is sound. When the urine is dense, high-coloured, and strongly acid, and deposits lithates abundantly, alkalies should certainly be given until the urine is restored to a normal condition.

Constipation also, if it exists, must be overcome, and elimination generally promoted. Potassium or sodium iodide often proves a very serviceable remedy, especially in those cases where elimination is defective ; it should be given in 5- or 10-grain doses three times a day in combination with potassium bicarbonate and aromatic spirits of ammonia, the latter to counteract the depressing effect of the iodide. Small doses of colchicum, added to an aperient pill, in constipated cases, and taken nightly, are often attended with benefit.

Guaiacum and *sarsaparilla* are remedies which have been greatly praised in the treatment of chronic rheumatism, and guaiacum will, in some cases, act with remarkable effect, especially in relieving the nocturnal pains, if a full dose be taken at bed-time. It acts best, however, in cases of chronic *muscular* rheumatism; yet it has the drawback of quickly losing its remedial effect.

Guttmann has advocated *salipyrin* (a combination of salicylic acid and antipyrin) in the treatment of rheumatism. He states that it rapidly removes the pain and swelling of the joints. The dose is 15 grains, which he gives in cachets every two hours. *Aspirin*, a recently-introduced salicyl compound, has been very favourably reported on by many physicians in this and in gouty joint affections. It does not disorder the stomach as some salicylates do, nor cause circulatory depression. We have found it useful in 15-grain doses (in cachets) at bed-time.

We have already alluded to the internal use of sulphur and ichthyol. In young people iron or arsenical tonics with cod-liver oil are useful in improving the resisting power and tone of the constitution, but this form of joint affection is not common in young subjects; they are more prone to the attacks of so-called "rheumatoid arthritis," which we shall presently consider.

The difficulty experienced by some in distinguishing between chronic articular rheumatism and chronic gouty arthritis, and the fact that gouty and rheumatic affections certainly appear together, not unfrequently, in the same person, has no doubt contributed to the very varying estimates formed by different observers of the value of different medicines in this disease. For the relief of these complex cases a more complex medication will be needed; and when a case of chronic rheumatism is over-lapped, as it were, by gouty manifestations, internal remedies directed to the relief of the latter will also be needed.

3. Lastly, the **hygienic** and **regiminal** treatment of chronic rheumatism has to be considered. The food of such patients should be light, nutritious, and readily digested. The digestive peculiarities of individual patients must be observed, and as nutritious a diet prescribed as is consistent with the maintenance of normal digestion. Whatever food tends to cause assimilative difficulties, a good test of which is the occurrence of deposits of lithates in the urine, should be prohibited. Fresh tender meat, poultry, game, and fish, in strict moderation; fresh vegetables, stewed celery, Spanish onions, lettuce, watercresses, broccoli, and ripe cooked fruits; rice, tapioca, and other farinaceous foods; butter, cream, milk; all these are admissible, provided that there is no digestive peculiarity which might cause any of them to disagree. A purely vegetarian diet has been found suitable by some patients. Fermented alcoholic drinks are best wholly avoided. Home-made lemonade and plenty of pure water are the best beverages. Avoidance of exposure to cold and damp, and thoroughly warm clothing and a warm bed should be insisted on. Too much clothing, however, is harmful, by producing an over-sensitiveness of the skin and confining the perspiration; but porous woollen garments, which, while keeping the surface of the body warm, allow of free cutaneous transpiration, should be recommended.

Rheumatic persons should inhabit dry, warm dwelling-houses, built on a dry subsoil, and protected from inclement winds. When their means permit, it is desirable that they should pass the winter in the south, in resorts which have a warm, dry, and equable climate.

CHRONIC MUSCULAR RHEUMATISM (MYALGIA).

Myalgia has been termed a "pseudo-rheumatic" affection, because some authorities doubt its *rheumatic* nature, and are more disposed to regard it as a neuralgia of the sensory nerves of the muscles. What is certain is that it often occurs in persons subject to chronic articular rheumatism, and that it can constantly be traced to the same etiological factors—viz. exposure to cold and wet, and especially to exposure after fatigue. And rheumatic myalgias require much the same treatment as the analogous joint affections. Persons who inherit the rheumatic or gouty constitution are well known to be especially prone to such attacks. The chief symptom is **pain,** usually limited to a certain particular set of muscles, although in some cases it will be more generalised. The pain is rarely accompanied by fever, and varies very much in intensity and duration. It is often excited or aggravated by particular movements, and it is relieved by *firm* pressure. It may disappear in a few days, or it may continue, with varying severity, for some weeks, and it is very prone to recurrence. One of the most painful and remarkable of these affections is that known as **lumbago.** It is remarkable because of the often extreme *suddenness* of its onset, and the occasional severity of the pain. A person is stooping to pick up some object on the ground, or to open a drawer, or is making some slight effort of a like kind, when he is suddenly seized with a severe pain in the muscles of the loins, which may completely incapacitate him for some days, and make it impossible for him even to turn over, or to lift himself in bed. This form is most commonly observed in men at or after middle age. Another form, met with most frequently in young people, is an affection of the muscles of one side of the neck, and termed **torticollis,** or *stiff neck*, as the head is held constantly to one side, in a fixed position; or the muscles on one side of the chest may be affected—the pectoralis major, the serratus magnus, and the intercostals—causing the respiratory or other movements of the chest to be painful. This is termed **pleurodynia.** Muscular groups in other localities may be similarly affected.

The **treatment** of these forms of rheumatism, *when chronic,* is determined by much the same principles as those which apply to chronic articular rheumatism; but attacks of myalgia frequently follow a much more acute course, and we therefore look to obtaining a more immediate result from treatment. In these acute forms the treatment should be both *local* and general.

It is needless to say that the painful muscles must be rested. Repose in bed is an important element in promoting a rapid cure. In pleurodynia this rest may be made more complete by controlling the thoracic respiratory movements on the affected side, by applying two or three broad strips of adhesive plaster firmly round the chest. *Dry heat* is a very efficacious remedy, and in cases of lumbago is best applied by covering the loins with a layer of flannel and passing a hot flat iron over it; or a large mustard plaster may be applied; or brisk friction with turpentine liniment, and then a thick layer of cotton-wool made as hot as possible, applied, and fixed with a flannel bandage, is an excellent remedy. Dry-cupping is advocated by some physicians. Other measures suited to an acute attack are hot baths or fomentations, followed by a dry hot pack; or a hot *vapour* or Turkish bath, with shampooing of the painful muscles. If the pain is strictly localised and limited, the application of the mixed belladonna and chloroform liniments (equal parts) often affords immediate relief. It should be applied on lint saturated with it, and over this a layer of oil silk should be placed, then some cotton-wool, and finally a flannel bandage. Applied in this manner it will be found to act as a powerful revulsive as well as anodyne. Fagge found the local application of methyl-chloride on lint remarkably efficient in relieving a severe case of lumbago.

Internal treatment is also useful in these acute cases, and if they are seen at the very onset, diaphoretics answer remarkably well. One of the best is a draught composed of 20 grains of salicin (or sodium salicylate), 12 grains of Dover's powder, a dram of spirits of nitrous ether, half an ounce of solution of ammonium acetate, made up to two ounces with camphor water. This taken at bed-time will usually produce profuse perspiration and complete relief of the pain. The patient should, however, be kept in bed the whole of the next day at least, and he should take salicin or sodium salicylate twice daily for a week or more. There can be no doubt of the great value of the salicylates in these cases. Should the urine be loaded with lithates, some alkali, such as 30 grains of potassium citrate, or 20 grains of potassium bicarbonate, should be given with each dose of the salicylate. The salicylate of cinchonidine has been warmly praised by some American practitioners. It is given in capsules or in tabloids in doses of 2 to 5 grains three or four times a day. Another salicylate which has been much prescribed in America, both in acute and chronic rheumatism, is *methyl salicylate* (the artificial *oil* of wintergreen). Internally, it is given in doses of 10 to 15 minims, either in capsules or made into an emulsion; externally, a dram or two poured on a double layer of aseptic gauze is applied to the part affected, then covered with impermeable material, and left on for several hours. Ammonium chloride is a favourite remedy with some practitioners, but we have not found it *very* efficacious. When the pain is very intense it may be necessary to give a hypodermic injection of morphine ($\frac{1}{4}$ gr.) and atropine ($\frac{1}{60}$ gr.).

Sir James Grant * has found *acupuncture* a very efficacious method of relieving certain forms of myalgia, as lumbago and pleurodynia. He uses fine steel needles (No. 8), a variable number according to the extent of the painful parts, and inserts them from $\frac{1}{2}$ to $\frac{3}{4}$ inch through the skin into the muscular tissue, from 1 inch to 2 or 3 inches apart. They are removed after a minute or two. The painful muscles, hard and tense before puncture, rapidly relax after puncture and the pain disappears. Sir James makes the interesting suggestion, which he illustrates by well-known experiments, that the needles set free an abnormal storage of electricity accumulated in the affected muscles.

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* "Abnormal Electrical Storage in the Human System," by Sir James Grant, M.D., F.R.C.P., Consulting Physician, General Hospital, Ottawa.

In chronic and less acute cases other remedies may be needed. Various local measures have been advocated. Blisters, the application of the constant current, Paquelin's cautery, stroking and kneading the painful muscles, a course of thermal baths, in lingering cases—each of these measures has in its turn been found very useful. It is desirable in these chronic cases to seek for any constitutional or diathetic indication for treatment. In distinctly gouty cases colchicum, potassium iodide, sodium salicylate, and alkaline-aperient waters, together with a carefully restricted diet, may prove curative. In the more purely rheumatic cases guaiacum and sulphur are valuable remedies. In anæmic and asthenic forms we may get excellent results from full doses of iron, arsenic, or quinine combined with strychnine, or nux vomica. As preventive measures, warm clothing, the avoidance of over-exertion and fatigue, and removal from a damp and cold locality to a dry and warm one, obviously suggest themselves.

ARTHRITIS DEFORMANS, OSTEO-ARTHRITIS, RHEUMATOID ARTHRITIS.

This disease, long regarded as a gouty or rheumatic affection, and commonly termed "rheumatic gout," differs, in the majority of cases, in its anatomical characters, its causation and its course and results, from both gout and rheumatism. It differs from gout in the absence of uratic deposits in the joints, and from rheumatism by the presence of extensive structural lesions, particularly in the form of erosions of the cartilages; disappearance of the cartilage leaves the ends of the bones bare, and these become smooth, dense and eburnated; irregular bony nodules (osteophytes) often develop at the margins of the articular surfaces, and, spreading to the capsule of the joint and other fibrous attachments, finally produce complete fixation and immobility of the articulation. The articular ends of the bones often increase in size (*hyperostosis*), but in old and very chronic cases the heads of the bones may atrophy.

Great deformity often results from these changes, and atrophy of the muscles may be extreme.

A particular form (*Heberden's nodosities*) specially affects the distal phalanges of the fingers, and *small hard nodules* appear at the sides. In such cases (more commonly in women) the larger joints are usually spared. *Acute* and *chronic* progressive forms have been described. The *acute* form affects many joints simultaneously, is attended with a certain amount of fever, and is apt to be mistaken for subacute rheumatism. The *chronic* form is the most common. The *symptoms* of this form consist of pain and swelling affecting certain joints symmetrically, and attacking usually those of the hands first, then the knees and feet, and finally, in extreme cases, nearly all the joints of the body. The pain may be but slight, or it may be very great, especially at night. Crepitation or grating can usually be felt on grasping the joints. In advanced stages, considerable muscular atrophy, and contraction and fixation of joints, lead to extreme deformity and helplessness. A rapid high-tension pulse has been observed in severe cases of the acute form. A spotty or patchy pigmentation of the skin has also been often observed. Another phenomenon, frequently noticed in these cases, is profuse sweating or constant dampness of the surface, especially of the palms of the hands.

In some fortunate cases, after two or three joints have been attacked, the disease becomes arrested; and in the majority the disease reaches a quiescent stage, in which, although there may be much crippling and deformity, there is freedom from pain, and the general health remains fairly good.

The causation and pathology of this disease are obscure. Of late years many observations have been made pointing to an *infectious* origin; its relation, in some instances, to previous attacks of influenza lends support to this view; cases of multiple arthritis indistinguishable in their clinical characters from "arthritis deformans" have been reported in connection with ulceration of the rectum,* and it is recognised by pathologists that various infective agents may give rise to anatomical changes in the joints precisely like those regarded as characteristic of this disease. The view here advanced as to the probably infective character of this disease, at any rate in some forms, renders it important from a therapeutic point of view to search carefully, in all cases, for a possible primary source of infection—as, for example, in the nose, ear, mouth, and alimentary canal, in the genital and urinary passages, or in the presence of suppurative lesions elsewhere. It is remarkably more common in women than in men, and it certainly appears to be connected in many cases with nervous disturbances or with conditions which depress the general health. Ovarian and uterine disease, and the climacteric period, have been regarded by some observers as having a causal relation to this affection. Prolonged anxiety, shock, traumatism, a life of hard work and over-exertion, exposure to cold and damp (as depressing agents), have all been invoked as etiological factors in the production of this disease.

It is important, from a therapeutic point of view, to note the apparent dependence of this disease on low, depressed states of health and defective nutrition, as well as on local irritation from over-exertion of certain joints.

Authorities differ greatly as to the curability or remediability of this affection, and this is not so much to be wondered at when we note that many writers confound together cases of this disease and cases of simple chronic articular rheumatism, the latter being a malady far more amenable to remedial and curative treatment. It is also often confounded with chronic articular gout.

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* Dr. E. J. Cave, of Bath, in *Brit. Med. Journal*, Oct. 12th, 1901, p. 1040.

Osler remarks that, "once established, the disease is rarely curable." Dujardin-Beaumetz held the same view. Others are more hopeful:

Spender, of Bath, testifies that "a joint, big or small, wrecked by osteo-arthritic disease, is the despair of medical art, according to our present knowledge."*

Great differences of opinion are also encountered, and probably for the same reasons, as to the value of hot baths in this disease; some claim quite brilliant results from thermal treatment; others with exceptionally large experience strongly caution patients against submitting to treatment by hot baths for fear of aggravating the disease; and, we imagine, most practitioners must have met with a considerable number of cases that have been made distinctly worse by treatment at thermal baths.

Massage, if practised too energetically and vigorously, as is sometimes recommended, will also aggravate certain cases; and it is most important, when massage is prescribed for these patients, that we should be careful to have it understood that it is to be of the gentlest possible kind, and applied tentatively. Massage of the *muscles*, however, is often of great service in promoting their nutrition and preventing atrophy and retraction.

Hutchinson and others have pointed out that occasionally changes of a truly gouty or rheumatic character are found co-existing with osteo-arthritis in the same patient, and sometimes in the same joint, and we may conclude that the cases especially benefited by thermal treatment are those which have affinities with chronic gout and rheumatism.

On the other hand, cases frequently appear in families with a marked tendency to tuberculosis, and these require a different line of treatment. It is necessary, therefore, in considering the most appropriate treatment of these cases, to investigate carefully their mode of origin, and the constitutional morbid tendencies existing in the patient's family.

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* "Osteo-Arthritis," p. 36.

Professor Stewart* formulates the following indications for treatment:—1st, To find out whether there is any source of infection, and to remove it if possible; 2nd, To combat any depressing influences; and 3rd, To increase the resisting powers of the tissues; to which we add a 4th, To allay any inflammatory action *still existing* in the joints.

Taking the last indication first, we see no objection to a careful application, in early stages of the disease, of warm baths of a temperature not exceeding 90° F., of not more than fifteen minutes in duration, and not taken more frequently than on alternate days. Together with the bath a light douche may be applied to the larger joints, and gentle massage or passive movements should be employed, chiefly with the view of preventing those morbid changes which lead to the fixation of the joints. What we would especially urge is gentle and tentative treatment *at first* in all cases, and that massage and douches are rarely applicable unless the joints are in a quiescent state. In selecting a bath we should be guided by the desire to find, at the same time, a warm, dry, sunny, and agreeable residence, where the patient could be much in the open air and in the sunshine. The warmth of Aix-les-Bains is one of its great advantages in the treatment of these cases; and Ragatz, in Switzerland, has also many claims to consideration. Wildbad and Baden-Baden are pleasant places, with excellent bathing arrangements, but they are not so warm and dry as the preceding. Bath and Buxton, in England, are suitable, but both places leave much to be desired in regard to climatic conditions. Treatment at Woodhall Spa has been found serviceable in some cases. *Daily sponging the joints* affected with warm water *at home, with gentle massage, is as useful in some cases* as removal to a bathing resort. We must not expect very great benefit from *electricity* in these cases. Erb, who has had a vast experience, does not pretend to have made any cures, but he considers he has occasionally improved the general nutrition as well as the local trouble. He applies the continuous current to the spinal cord for from ten to fifteen minutes at a sitting, to the *cervical* region when the upper extremities, and to the *lumbar* region when the lower extremities are chiefly affected; and a continuation of the treatment for *several months* is advocated! Steavenson applied electric baths in this disease, and, he thought, with some benefit; faradisation and galvanism certainly help the nutrition of the wasted muscles.

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* Hare's "System of Practical Therapeutics" (second edition), vol. i., p. 646.

As to the value in the treatment of this affection of *hot-air* baths, we agree with Professor Stewart that their "early claims were much exaggerated," but that they occasionally relieve "some of the more distressing symptoms." When there is much pain in the joints, with restlessness and sleeplessness, "a few hot-air baths generally quickly give relief." But in the chronic stages he has found them of little or no benefit.*

Direct counter-irritation is an expedient of doubtful efficacy; it may relieve some cases, but it aggravates others. Sponging with water as hot as can be borne has been recommended; but even this simple method must be watched carefully, lest increased activity of the disease be thereby excited.

We have found benefit from the application of *iodine* paint, *not* directly over the affected joint, but *between* the affected digital joints, and an inch or two above and below the large joints of the limbs.

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* Hare's "System of Practical Therapeutics" (second edition), vol. i., p. 650.

Gentle friction of the joints with some mildly stimulating liniment, together with gentle passive movements, applied twice daily, will be often found as useful a local measure as any. After bathing the joints with hot water, the following liniment may be used :—

℞ Olei pini sylvestris	℥iv.
Tincturæ iodi	♏lxxv.
Linimenti saponis	ad ℥iv.

Misce, fiat linimentum.

If there is much pain in the joints, ½ ounce of laudanum may be added to the above. If the joints are hot and swollen, as well as painful, the patient had better be kept at rest in bed for a time, and the joints may be rendered motionless by suitably applied splints. Cold compresses, if they are grateful to the patient, may at the same time be employed.

Next as to the value of internal medicinal treatment. The utility of *salicylates* in this malady seems to be restricted to the acute, painful exacerbations. The *sodium salicylate,* in full doses, will often be found to alleviate greatly the pain and swelling of the joints, as it does in acute rheumatism—a circumstance which has led some physicians to conclude that osteo-arthritis must have some etiological relation to that disease. But this drug certainly seems to have the property of relieving inflammation and pain arising from a variety of causes. *Aspirin* has also been given in these cases. *Iodine* has been found beneficial, internally, by many. Lasègue advocated its employment in full doses; he gave the tincture. It may be tried in 10-minim doses thrice daily in a wineglassful of syrup and water; others prefer potassium iodide, 5 to 15 grains thrice a day. We agree with Garrod in preferring the iodide of iron. A teaspoonful of the syrup may be given after meals three times a day.

The use of **tonics** responds to the chief indications formulated for the treatment of this disease, and of these *arsenic* is of special value. It is well to give it in combination with iron; $\frac{1}{24}$ to $\frac{1}{12}$ of a grain of sodium arsenate, with a dram of syrup of the iodide of iron, or with 10 grains of the citrate of iron in an ounce of water, may be given after each meal thrice daily. *Cod-liver oil* also is of great service, and some have thought the disease may be checked in its earliest stage by this remedy alone. It should be given in small doses at first, and gradually increased till the patient is taking two or three tablespoonfuls daily. Quinine is very useful in sub-febrile cases, and, combined with belladonna and strychnine, is serviceable in checking the tendency to perspiration. The following is a good combination :—

℞ Quininæ sulphatis... :..	gr. xlviii.
Strychninæ sulphatis	gr. $\frac{1}{2}$.
Extracti belladonnæ	gr. iij.
Syrupi	quantum sufficiat.

Misce, fiat massa in pilulas quatuor et viginti dividenda. One, three times a day.

Dietetic and *hygienic* treatment is of much importance. The diet should be as generous and varied as is consistent with the avoidance of dyspeptic troubles. Animal food and fat should be freely partaken of, and a certain moderate amount of sound wine or beer may be permitted, unless there is a tendency to acute exacerbation of the joint affections, when it will be best to avoid alcoholic drinks altogether. Exercise in the open air should be encouraged—riding, driving, or walking, as is best suited to the individual case. It is of the greatest importance that all risks of chill should be avoided, and as these patients are prone to perspire freely they should not only clothe warmly, but they should wear some absorbent material, such as flannel, next the skin. They should avoid exposing themselves to damp, cold winds, and they ought to live in warm, dry houses built on sand or gravel. *Climate* is of immense value, and if a patient can, at the very onset of the malady, be removed to a warm, dry, equable climate, it affords him the very best possible chance of cure. Indeed, when benefit follows from thermal treatment it is often largely due to the change of climate and scene, the escape from daily worries, the life in the open air, and the judicious regulation of the diet, which can be found at a well-selected spa.

ADDITIONAL FORMULÆ.

Mixture for rheumatism.

℞ Potassii iodidi, ʒij.
Sodii salicylatis, ʒj.
Syrupi simplicis, ℥j.
Aquæ menthæ piperitæ ad ℥vj.
M. f. mist. A tablespoonful twice or thrice daily.
(*Dujardin-Beaumetz.*)

Mixture for chronic rheumatism.

℞ Sodii iodidi, ʒij.
Sodii bicarbonatis, ʒiv.
Potassii bicarbonatis, ℥j.
Liquoris arsenicalis, ʒjss.
Decocti sarzæ compositæ ad ℥xx.
M. f. mist. A small tablespoonful in a claret-glassful of effervescing potash-water three times a day after meals.
(*Whitla.*)

Mixture for chronic rheumatism.

℞ Pulveris guaiaci resinæ, ʒj.
Potassii iodidi, ʒj.
Tincturæ colchici seminum, ʒvj.
Syrupi, ℥ij.
Aquæ cinnamomi ad ℥vj.
M. f. mist. A dessertspoonful to a tablespoonful twice daily. (*Philadelphia Hospitals.*)

Anti-rheumatic mixture

℞ Sodii salicylatis, ʒiij.
Aquæ laurocerasi, ℥j.
Spiritus vini rectificati, ℥ss.
Syrupi simplicis, ℥j.
Aquæ ad ℥vj.
M. f. mist. A tablespoonful twice to five times daily.
(*Dujardin-Beaumetz.*)

Pills for chronic rheumatism.

℞ Acidi arseniosi, gr. jss.
Pulveris guaiaci, ʒjss.
Pulveris capsici, gr. xv.
Pilulæ aloes et asafœtida, ʒjss.
M. et divide in pil. lx. One three times a day.
(*Fothergill.*)

Confection for chronic rheumatism.

℞ Pulveris guaiaci resinæ, ʒiij.
Pulveris rhei, ʒij.
Potassii tartratis acidæ, ʒv.
Sulphuris sublimati, ʒx.
Pulveris myristicæ, ʒj.
Mellis, q.s.
Ut f. confectio. About half a small teaspoonful night and morning. (*Fernandez.*)

(This contains the same ingredients as the so-called "Chelsea Pensioner." *See* Note, p. 492, *post.*)

Anti-rheumatic syrup.

Take of
Sarsaparilla, cut and bruised, 2 oz.
Guaiacum chips, 2 oz.
Water, 4 pints.
Boil down to 16 oz., and add 32 oz. of sugar.

Next, take of
Extract of opium, 10 grains.
Resin of guaiacum, 4 drams.
Carbonate of potash, 3 drms.
Tinct. of colchicum, 2½ drms.
Essence of lemon, 2 drops.

Rub these together, and add little by little to above syrup when cold, and strain. Half a teaspoonful or a teaspoonful for a dose. (*Dubois.*)

Liniment for muscular rheumatism.

℞ Chloroformi }
Olei olivæ } āā ℥j.

M. f. linim. To be rubbed over the painful regions. (*Bamberger.*)

Liniment for chronic rheumatism.

℞ Liquoris ammoniæ }
Olei terebinthinæ } āā ℥ss.
Olei olivæ, ℥j.
Olei limonis, ʒss.
M. f. linim. (*Copland.*)

Another.

℞ Olei cajuputi, ʒij.
Tincturæ opii, ♏lxx.
Olei terebinthinæ, ℥ss.
Linimenti ammoniæ, ℥j.
M. f. linim. (*Fuller.*)

Liniment for chronic rheumatism.

℞ Tincturæ aconiti, ʒj.
Olei terebinthinæ, ℥j ad ℥ij.
Tincturæ opii, ʒvj.
Linimenti saponis ad ℥vj.

M. f. linim. To be used three times a day. (*Hare.*)

Ointment for chronic rheumatism.

℞ Veratrinæ, ʒj.
Hydrargyri protiodidi, ʒj.
Unguenti petrolei, ℥j.

M. f. ung. To be applied over the joints. (*Hare.*)

CHAPTER II.

THE TREATMENT OF GOUT.

Phenomena of an Attack of Acute Gout—Relation of Uratic Deposits to Articular Gout—Other Gouty Lesions—Cardio-Vascular and Renal Changes—Neuralgic and Cutaneous Affections—Blood State in Gout—How are the Phenomena of Irregular Gout produced?—"Uric Acid does not cover the whole Field of Gout"—Sir William Roberts's Observations—Criticism—Etiology of Gout—Gout a Disorder of Retrograde Metabolism—*Indications for Treatment*—Value of Colchicum—Of Salicylates—Of Guaiacum—Of Potassium Iodide—Of Alkalies—Clinical testimony to their efficacy—Lithium Salts and Piperazine—Magnesium Salts—Mineral Waters in Gout—Vichy, Carlsbad—Sodium Chloride Springs—Lime Springs—Indifferent Thermal and Sulphur Springs—Value of Water as an Eliminant and Solvent—Usefulness of Hot Baths—*Treatment of an Attack of Acute Gout*—General and Local—Treatment of Chronic Forms—Pistoja Powders—*Dietetic and Regiminal* Treatment. Additional Formulæ.

In order to be able to discuss, with advantage, the treatment of gout, we must first consider, as briefly, however, as possible, its chief clinical manifestations and its pathological nature.

The clinical characters of an attack of **acute gout** are the following:—Its onset is sudden, often in the night, and its seat is usually the ball of the great toe, or it may attack the ankle, heel, or instep. The part attacked, at first, feels somewhat hot and painful, and the pain increases quickly in severity until it becomes intense and almost unbearable; the tenderness is also exquisite, and the patient cannot endure even the contact of the bed-clothes. Soon there is some fever with shivering and chilliness, and the temperature may rise to 102° or 103°. The pain after a few hours often remits and is less severe. The veins around the painful joint first appear swollen, and shortly the whole joint becomes swollen, tense, shining, and of a deep red colour. The subcutaneous tissues are œdematous, and pit on pressure. For the next few days there are usually evening exacerbations and morning remissions, and it is not uncommon for the other foot to be attacked in precisely the same manner. The duration of the attack is variable; it may be over in a few days, or it may be composed of a series of minor and irregular paroxysms, which may incapacitate the patient for many weeks. The skin desquamates as the swelling subsides.

An attack of acute gout is commonly preceded by some troubles of digestion—acidity, flatulence, loss of appetite, constipation, and scanty, high-coloured urine. After the attack the patient not unfrequently feels much better than he has done for some time. The attacks are prone to occur at irregular intervals, their frequency often being determined by the mode of life of the patient; but in some instances, whatever care he may take, the attacks return with increasing rapidity, and finally he is left with joints permanently crippled, deformed and disabled by gouty infiltrations and deposits.

It must, however, be remembered that, nowadays, gout does not appear so frequently in this acute form, and the joint affection is often slow in developing, and a good deal of minor uneasiness in the part may be for some time complained of, before the characteristic acute swelling, redness, and tenderness appear.

Although the great-toe joint is usually the first to be attacked, other joints generally suffer, especially the smaller ones, the digital joints, and the ankles and wrists.

It is believed that these joint affections are dependent on the precipitation and deposit of sodium biurate crystals in the cartilages, ligaments, synovial membranes, bursæ, and other structures forming part of, or in proximity to, the articulation. In some of the most distressing forms of *chronic* gout, the joints of the fingers, and less frequently those of the toes, become surrounded by massive deposits of sodium biurate (*tophi*) which sometimes slowly ulcerate through the skin; we have seen masses as large as horse-beans thus discharged. Such patients are often by this means rendered absolutely helpless, and cannot even feed or dress themselves. Small deposits of urate of soda are also often observed on the margins of the ears, and occasionally on the inside of the eyelids, on the arches of the palate and elsewhere.

All *gouty* persons do not, however, suffer from such decided manifestations of *articular* gout. They may occasionally have twinges of pain in the joints, and a hot condition of the hands and feet, and perhaps a little thickening around some of the digital articulations; but they are apt to suffer from other disturbances of health, dependent apparently upon blood states, similar to those which, in other persons, give rise to attacks of articular gout. The most serious of these are the *cardio-vascular* and *renal* changes that are determined by the gouty state. "The blood tension is persistently high, the vessel walls become stiff, and cardiac and renal changes gradually develop" (*Osler*). The existence of a gouty phlebitis is generally recognised. Headaches, especially migraine, and neuralgias of various nerves, including visceral nerves, not unfrequently arise. Certain skin affections, especially eczema, are also prone to appear in such persons; and many inflammatory disorders of the various mucous membranes are believed to be dependent upon or aggravated by gouty irritation.*

The blood in chronic gout is said always to contain an excess of uric acid, and Sir William Roberts stated that uric acid in the blood "passes into solution in the first instance as a quadri-urate," and he infers "that in the *normal* state uric acid is primarily taken up in the system as quadri-urate," and is finally voided in the urine as quadri-urate; and in health its elimination is sufficiently active and complete to avoid its detention or accumulation in excess in the blood. His hypothesis was that "in the gouty state this tranquil process is interrupted, either from defective action of the kidneys, or from excessive introduction of urates into the circulation, and the *quadri-urate lingers unduly in the blood and accumulates therein.* The detained quadri-urate circulating in a medium which is rich in sodium carbonate gradually takes up an additional atom of base and is thereby transformed into *biurate*"—a less soluble and less easily secreted compound.

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* The late Sir George Paget, when taking part in a discussion on the *Therapeutics of the Uric-acid Diathesis*, which the author opened at the Meeting of the British Medical Association in Dublin in 1887, pointing to a long list of morbid conditions the author had drawn up as dependent on or associated with gout, said in support of the reality of the connection, "I think I may say I have had all of them!"

How uric acid in the blood produces its injurious effects, whether by *mechanical* injury due to the precipitation of crystals of sodium biurate in the tissues, or by circulating in the blood in solution as a *true poison*, he thought easy of explanation so far as *regular* articular gout was concerned. "The crystalline urates precipitated in the cartilaginous and fibrous structures of the joints necessarily act as foreign bodies; they excite irritation, clog the lymph channels, exercise pressure on the tissue elements, and impede their nutritive operations,"* hence the inflammation, pain, swelling, and subsequent degenerative changes in the joints.†

But it is difficult to accept this *mechanical* theory as explaining the phenomena of *irregular* gout. "The visceral disturbances and manifold neuroses which trouble the gouty have not yet been anatomically traced to uratic precipitation." Sir William Roberts saw equal difficulty in adopting the toxic view. He argued that there was no proof that uric acid is poisonous. "The system of the gouty man is at times surcharged with uric acid. On the eve of an outbreak the fluids of his body—in parts, at least—must be impregnated with biurates to saturation; for, of course, no precipitation can occur until this point is reached. Yet, with fluids thus saturated with urates, such persons betray not the slightest sign of poisoning, and enjoy complete immunity from symptoms of every kind until overtaken unwarned by the sudden precipitation which provokes the arthritic attack." But this statement, although applicable to some of those who suffer from attacks of typical acute gout, does not apply to the sufferers from irregular gout. The individual who is prone to attacks of acute arthritic gout rarely, it is true, suffers from the *irregular* non-arthritic form, because, we take it, his other tissues are but slightly sensitive to the gouty poison; whereas the sufferers from *irregular* gout possess tissues peculiarly sensitive to it, which react to the poison and resent its presence long before it has accumulated in sufficient quantity to be deposited in the joints, or probably to assume a crystalline form. In answer to Sir William Roberts's other argument that "manifestations of irregular gout are so extremely diverse in seat and character that it is hard to believe that they can be produced by one and the same toxic agent," we would point to the familiar and analogous phenomena which attend the toxic action of certain drugs, in persons hypersensitive to their action; the smallest dose of quinine will produce an erythematous rash in one, a headache in another, and gastric discomfort in a third. Alcohol will poison one man's motor centres, leaving his intellect scarcely touched, while in another it will obscure his intelligence and leave his motor centres comparatively unaffected. Many other illustrations of this nature might be advanced, so we think this objection is not a valid one. With another opinion of this author we are more entirely in accord—viz. that uric acid does not "cover the whole field of gout," and that "if uric acid were altogether eliminated a pathological entity would still remain and be recognisable as gout."*

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* Croonian Lectures on "Uric-acid Gravel and Gout;" also his article on "Gout" in Allbutt's "System of Medicine," vol. iii.

† In the *Lancet*, of June 16th, 1900, Turnicliffe and Rosenstein, in an elaborate and able paper, have called in question the correctness of these chemical views of Sir William Roberts. (They have also been challenged by Pfeiffer, Minkowski and others.) "These views," they observe, "seem to have been more or less accepted and passed into many text-books, although they have received no experimental confirmation," while their own experiments led them to the conclusion that "there is no evidence of the existence of a third order of uric acid salts—*i.e.* the quadri-urates—either in the artificial or natural amorphous urinary deposits, or in the fluids of the body;" and they further state that "any theory concerning the pathology or treatment of gout or the uric-acid diathesis built upon the assumption of the existence of quadri-urates requires reconsideration."

Professor Bouchard has expressed the same opinion. He says, "It has by no means been demonstrated that in gout uric acid is the only or even the chief matter contaminating the fluids . . . many of the chronic lesions of gout are in part composed of or occasioned by precipitated urates; but the disease itself is not due to uricæmia."†

If we accept Sir William Roberts's argument that the phenomena of irregular gout may be due to precipitation of crystalline urates in the tissues, this view would dispose of the assumption that uric acid and its compounds are *toxic*, and would refer their morbid influence solely to their "sparing solubility in the bodily media," and their consequent proneness to precipitation in the crystalline form.

If this view of the nature and causation of the morbid phenomena of irregular gout be accurate and sufficiently comprehensive, the chief therapeutic indication, when such phenomena were actually present, would be to endeavour to increase the solvent power of the blood and the fluids of the body for crystalline sodium biurate, so that it might be eliminated. But there is good reason to doubt whether the therapeutic indications of the gouty state are so simple as this. Sir William Roberts showed conclusively that many of the substances given as remedies for gout, in the belief that they promote the holding in solution and thereby prevent the deposition or even favour the re-solution of sodium biurate, could not so act, and he inferred that they could not be remedies for gout. This inference, however, covers far more ground than the premisses from which it is deduced. Sir William Roberts subsequently admitted that uric acid "does not cover the whole field of gout," and the error, we imagine, lies not in the conclusion that none of these substances are remedies for gout, but in the explanation which has been advanced of their mode of action.

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* Report of Proceedings of the Medico-Chirurgical Society, in *Brit. Med. Journal*, Jan. 14th, 1893.

† "Maladies par Ralentissement de la Nutrition" (second edition), p. 264. *See* also the author's address to the Balneological and Climatological Society on "Hepatic Inadequacy and its Relation to Irregular Gout," *Brit. Med. Journal*, June 15th, 1901.

Supposing the precipitation of crystalline sodium biurate to be the ultimate or penultimate manifestation of the morbid state which we call gout; yet it may fairly be concluded that those substances which Sir William Roberts asserted must be useless, or even worse than useless, in their effect on these final precipitations, may influence beneficially the antecedent determinant morbid states, as indeed they have by actual experience been found to do; and as some of these seem to have a remarkable influence over the irregular manifestations of this disease, we may be permitted to believe that they exert their influence over that portion of the "field of gout" which is not covered by uric acid! *

The sodium salts, for instance, which he especially repudiated, may exert their remedial influence by a beneficial action on the gastric, intestinal and hepatic functions, or on the nutritive changes in the tissues, quite irrespectively of any direct solvent action on sodium biurate. By their action on the liver they may prevent "the excessive introduction of urates into the circulation," or by their stimulating action on the kidneys they may counteract the tendency to their "unduly lingering in the blood and accumu-

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* Garrod maintained that in gout the alkalinity of the blood is lessened, and he attributed the deposition of the urate of soda to the *diminished alkalinity* of the plasma; but Sir William Roberts contended that "alkalescence, as such, has no influence whatever on the solubility of sodium biurate," and it is now known that an alkalinity of the blood in gout is either *normal* or *increased*.

lating therein," so that their influence may be in the truest and best sense *remedial*, inasmuch as they would attack the morbid processes nearer their origin and source.

We have unavoidably gone beyond our usual limits in our examination of the modern views of the pathological nature of the gouty manifestations; we must now enumerate briefly its known etiological factors, and then proceed to consider its therapeutics.

The hereditary character of gout, its tendency to appear in the male much more frequently than in the female, its preference for adult age, though occasionally met with in childhood, its proneness to attack persons who live too freely, and who consume food and stimulants, especially wine and malt liquors, in great quantity, its association with chronic acid dyspepsia, its peculiar prevalence in climates such as that of the British Isles—cold, humid and changeable—its occasional determination by depressing emotions and intellectual strain, and its singular connection with lead intoxication—all these, its chief etiological relations, are well known.

We believe the best guide to the treatment of gout is the acceptance of the fact that it is mainly a **disorder of elimination,** and especially of hepatic elimination—a defect or feebleness in the function or functions of elimination of the waste products of nutrition. This defect may be inherited, and then it appears occasionally in a very intractable form. It may be acquired, and is then more readily ameliorated and controlled.

We have ventured elsewhere to speak of gout as "disturbed *retrograde* metabolism." It can scarcely be a disorder of *constructive* metabolism, for it rarely occurs during growth and development, and in many of those who are prone to its visitations constructive metabolism is remarkably vigorous active, and apparently normal. Its comparatively rare occurrence in women, who produce much less nitrogenous waste than men, owing to their less active lives, and who have an additional outlet for waste products in the menstrual flux, further corroborates this view. There is reason, then, for concluding that in the gouty the constructive metabolism may be normal, but the **destructive metabolism,** the processes for the removal of waste, are prone to morbid disturbance, and that *inadequacy of the hepatic functions* is at the root of many of the irregular forms of gout.

The **general indications** in the **treatment of gout,** then, are, first, to promote *elimination* of waste; and secondly, to prevent *accumulation* of waste. In the management of the *acute* arthritic attacks we have the additional indication to allay local pain and inflammation, and in the chronic joint affections to endeavour to restore the normal mobility of the joints.

We must take a larger view of "the whole field of gout" than that covered by the uric-acid theory, and we must set ourselves free from any domination by *a priori* considerations deduced from experiments outside the human organism.

The appeal to practical therapeutic results is the best test of the probability of any theory put forward in explanation of the phenomena of gout.

It will be convenient, in the first place, to discuss the value of certain of the remedies proposed for the treatment of gout, and subsequently to refer to certain details in the management of the acute attack and of other manifestations.

We will commence with **colchicum.** This remedy was at one time much discredited, and it had, no doubt, in former times been misused. When attacks of acute arthritic gout were far more common than they now are, *over-doses* of colchicum were no doubt often given, and evil results naturally followed. But most of those who have had the largest opportunities of forming an opinion of the value of colchicum in gouty affections are advocates of its use.*

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* Graves, Watson, Garrod, and many others.

Its most constant action is, we believe, on the hepatic secretion. Again and again, when the motions have been pale and clay-coloured from the absence of bile, we have seen a few doses of colchicum restore the natural dark colour due to a proper admixture of that secretion. It seems to act sometimes as a diuretic, and sometimes as a diaphoretic, and when it acts more especially on the skin the renal secretion may appear to be diminished by it, and naturally, also, when it causes watery alvine evacuations.

Graves thought, and Lecorché supports the view, that it prevents or checks the formation of uric acid in the system, and this it may do by its decided action on the liver. Our own view is that it acts more or less on all the excretory organs; that it is a stimulant to excretion; and as we regard the gouty constitution as one whose fault is especially a sluggish and imperfect retrograde metabolism, and delayed excretion generally, not necessarily of uric acid alone, colchicum is in a special sense its remedy by promoting the elimination of waste products.

The prejudice against colchicum has induced Ebstein to make the extraordinary statement that it is preferable to relieve the pain of the gouty paroxysm by hypodermic injections of morphine. He says they act "quicker, more easily, and with less danger." We join issue with him here. No doubt they act *quickly!* But the internal use of opiates in gout we consider, save in exceptional circumstances, undesirable. In a disease of defective elimination ought we to give a drug which depresses in a remarkable manner the function of all the excretory organs but the skin?

Colchicum, then, we maintain, is one of the most valuable remedies, when judiciously given, for most of the morbid manifestations of gout, and so far from being always a dangerous vascular depressant, we have shown, in our hospital practice, that in a case of chronic gout with subacute exacerbations, moderate doses of colchicum restored regularity and strength to an irregular and feeble pulse, and this, no doubt, it did by promoting the elimination of substances which were depressing the cardiac tone!

Much difference of opinion exists as to the value of the **salicylates** in gout. We do not think sodium salicylate of great use in true articular gout, unless it should occur—and there is no reason why it should not—in a rheumatic subject. But it is certainly of value in chronic affections of joints allied to rheumatism, and which may have been diagnosed inaccurately as gout. Its action as a hepatic stimulant undoubtedly makes it serviceable in some forms of irregular gout, and also in cases of regular acute gout associated with hepatic inadequacy. It also relieves nearly all forms of articular pain. We are not, therefore, disposed to set it aside, as some authorities do, as without value in gout. We must also remember that its use, in certain forms of gout, has been commended by such skilled practitioners as Professor G. Sée, Bouchard, Dujardin-Beaumetz, Lecorché, Whitla, and others. Lecorché found it very useful in the treatment of gouty asthma, angina pectoris, and cystitis. Bouchard thinks it a dangerous drug in cases of cardiac degeneration or cases in which the kidneys are involved. Dujardin-Beaumetz also held that in cases of renal "impermeability" its use was not advisable.

We regard it as a valuable alternative remedy in acute and highly febrile attacks of gout with high pulse tension in otherwise healthy subjects, and in chronic forms which prove intractable to other remedies.

The high commendation given by Garrod to the use of **guaiacum** in chronic articular gout has found but few adherents. "I could relate," he says, "many hundreds of cases in which guaiacum has proved especially valuable; in some its action is almost magical. I have now for twenty years or more employed guaiacum very extensively in the treatment of chronic gout—I believe, in some thousands of cases—and there is no remedy of which I can speak so confidently." It is remarkable how little attention has been paid to this recommendation. We have certainly found this drug give great relief to the muscular pains of persons who were undoubtedly subjects of gout.*

A more universally accepted remedy is **iodide of potassium.** Its use in common arthritic affections is widespread, but it has its most important applications, we believe, in the less easily recognised degenerative changes dependent on this diathesis. We allude especially to the renal and vascular changes. Iodide of potassium, if long continued in fairly large doses, has a remarkable influence in retarding the progress of those degenerative vascular changes dependent on the gouty constitution, which, if left untreated, sometimes advance with great rapidity.

In cases with albuminuria and well-marked vascular and renal changes we have found iodide of

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* In the copy of a letter, dated October 23rd, 1813, in the possession of the author, reference is made to "a lately-discovered medicine for the cure of the gout—a very valuable discovery of a medicine of great efficacy; the secret had been brought from America by a British soldier many years ago. It had been given with almost unfailing success to vast numbers of his fellow-pensioners at Chelsea Hospital, and its fame had become so general that the medicine was called 'The Chelsea Pensioner.' Lord A., in consequence, applied for it and received the utmost benefit, but the person who possessed the secret did not at first attend to any proposal for divulging the mode of preparing the medicine; but at length he has accepted £500 and an annuity of £200, and has given up the secret which I now enclose to you. Manner of making the medicine for the gout or rheumatism called 'The Chelsea Pensioner':—

Guaiacum Powder	1 dram.
Rhubarb	¼ ounce.
Cream of Tartar	1 ounce.
Flower of Sulphur	2 ounces.
Clarified Honey	1 pound.

A Nutmeg, powdered fine.

"Mix the above ingredients well together and stir the mixture well every time before taking a dose. The dose is two large teaspoonfuls at night and morning; and continue thus taking it till the whole is taken. If it operate in a very active way, the morning dose may be sometimes omitted."

potassium or sodium (the latter is less depressing), in daily doses of 15 to 30 grains, continued for a few weeks, and repeated from time to time, of remarkable value in improving the general condition; and we have not unfrequently seen the albumen disappear from the urine, or be reduced to a mere trace. How the iodide acts in these cases we are not prepared to say; but it promotes the action of certain of the excretory glands, and sometimes acts as a powerful diuretic. Its influence in promoting the elimination of deposits in the tissues is established by its power of removing lead and mercury from the system in cases of chronic intoxication by these metals. It is necessary to "feel one's way" with regard to dose, some constitutions requiring a much larger one than others. We repeat that iodide of potassium is a valuable remedy, not only in the chronic and subacute arthritic affections of this diathesis, but also in the graver but less *obvious* arterial and renal changes.

The value of **alkalies** in the treatment of gout has been almost universally accepted. But Sir William Roberts * challenged the validity of that opinion, and we must therefore examine this subject fully. "Clinical experience," he said, "on the use of alkalies speaks with a doubtful voice;" and the hypothesis that by "increasing the alkalescence of the blood they enhance its solvent power on the material of gouty deposits and thereby delay or prevent their formation," he considered the evidence of his experiments "entirely destroyed." "It has," he said, "been conclusively proved that alkalescence, as such, has no influence whatever on the solubility of sodium biurate."

We must, then, either give up the use of alkalies in gout, which we are not disposed to do, or we must find some other explanation of their mode of action, or we must be content to administer them as we do colchicum, without knowing precisely how they act.

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* Croonian Lectures.

But let us see what is the testimony of clinical physicians on this matter. Professor J. Stewart says, "Alkalies are of value in relieving not only the arthritic symptoms present in an acute gouty attack, but they also tend to remove or lessen the amount of uric acid in the blood."* Dujardin-Beaumetz, commenting on the utility of alkaline waters, observed that "they do not act by neutralising an excess of uric acid, but by acting on the *general nutrition*, the functions of which they regulate."† "Alkalies," testifies Professor Whitla, "by forming soluble salts with uric acid, which salts, acting as diuretics, are freely washed out in the urine, cause marked elimination of uric acid, and are the most valuable of gouty remedies."‡ Professor Bouchard points out that "the alkalies are indispensable to certain acts of disassimilation [what we have termed 'retrograde metabolism']; without alkaline bases the organic acids could not be consumed in the economy," and their utility in gout he would refer to their influence in quickening nutritive changes.§ "Alkalies," Fagge observes, "are decidedly useful in gout."|| Lecorché maintains that "the bicarbonates and the sulphates [he prefers the sodium salts] are *par excellence* the medicines for the gouty diathesis,"¶ and he bases his conclusion upon the influence they exert over the metabolism of nitrogenous substances. "Alkaline waters," says Professor Dieulafoy,** "are of incontestable efficacy." Niemeyer, while expressing a strong conviction of the value of alkaline waters in gout, is careful to state that his belief is not based on the supposition that they act in any special manner on *uric acid.*††

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* Hare's "System of Practical Therapeutics" (second edition), vol. i., p. 662.

† "Clinique Thérapeutique," vol. iii., p. 512.

‡ "Dictionary of Treatment," p. 306.

§ "Maladies par Ralentissement de la Nutrition."

|| "Practice of Medicine," vol. ii., p. 684.

¶ "Traité de la Goutte," p. 554.

** "Pathologie Interne," tome iii., p. 505.

†† "Practice of Medicine," vol. ii., p. 504.

Sir Thomas Watson, without reference to any theory of uric acid elimination, and supporting a recommendation of Sir H. Halford, advises as a prophylactic remedy that *every day* 15 grains of potassium bicarbonate should be taken with tincture of rhubarb and some light bitter.*

With this mass of evidence before us, which we could largely increase, we cannot accept the conclusion that "clinical experience on the use of alkalies" in gout "speaks with a doubtful voice." Their remedial influence in gout may largely depend on their remedial effects on coincident morbid disturbances of the gastric and hepatic functions. It is worthy of note that the majority of French authors, who have not fallen so much under the influence of Garrod's teaching, and who have regarded the value of alkalies in gout to depend rather on their general influence on metabolism than on their special solvent influence on uric acid, have mostly advocated the use of the sodium salts, while those who have been dominated by the idea of exerting a solvent action on uric acid have preferred salts of potassium and lithium.

It is further worthy of note that, in spite of all the theoretical denunciations of the use of sodium salts in gout, the gouty, from all quarters of the globe, have resorted, and continue to resort, in steadily increasing numbers, to those Continental springs in which the salts of sodium are overwhelmingly predominant.

As an instance of the confusion that exists in the minds of some of the most eminent authorities on this matter, we would quote an observation on the treatment of gout from a recent text-book: "Potash water, Apollinaris or seltzer water should be taken freely. Waters with the sodium salts should be avoided." Now the chief mineral constituents of both Apollinaris and seltzer waters are *sodium* salts!

As to the superiority of lithium salts in gout as promoters of the solubility of sodium biurate, and as tending to prevent the formation of uratic deposits, Sir William Roberts's conclusions were that they had not the slightest effect of this kind; and the same with regard to the much-lauded "piperazine."

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* "Principles and Practice of Medicine," vol. ii., p. 773.

"If these bodies," he says, "have any beneficial action in gout, it is certainly not due, as has been supposed, to their solvent action on the material of gouty concretions."*

The value of lithium salts in the treatment of gout has been greatly over-estimated. Although the equivalent of lithium is low, and the necessary dose is small, most of its preparations are far less soluble than those of potash and soda, and we fail to see any decided advantage in being able to give 4 grains of lithium carbonate instead of 8 grains of potassium bicarbonate; and even Garrod does not claim so large a relative superiority as this for the lithium salts. The diuretic effect of potassium bicarbonate is more constant and reliable, especially when given with hot water containing a little milk, which quite conceals its taste. If we select a mineral water for the treatment of gout, solely and specially because it contains, say, a tenth of a grain of lithium chloride in a pint, our practice can hardly be said to be *rational*.

Of the depressing effect on the heart of large doses of salts of lithium we have seen many examples, and we have reason to know that the popular and indiscriminate use of lithium preparations, now so common, has exercised a seriously injurious effect on many persons.

Ebstein maintains that lithium chloride has no solvent action on uric acid, and that if a mineral water contains the carbonate, in very minute quantities, it becomes wholly converted into chloride in the stomach, and is therefore, as far as the lithium salt is concerned, quite without efficacy.

The superiority of the sodium compounds in dyspeptic states, in gastric and intestinal catarrhs, and in disturbance of the functions of the liver, so common in the subjects of this diathesis, is admitted by Garrod himself. We are convinced, from our own observations, that a *combination* of alkaline salts acts often more efficaciously in removing an acid condition of the fluids than either alone.

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* Croonian Lectures.

It has been suggested that we have been to blame in allowing the compounds of lime and magnesia to fall into disuse in the treatment of the gouty constitution. Salts of magnesia are found in many of the mineral springs which enjoy a reputation in the treatment of this diathesis, and many gouty patients have testified to the great benefit they have found in frequently taking a dose of Gregory's powder.

The old-fashioned "white mixture" so frequently prescribed for gouty patients is, as is well known, a combination of sulphate and carbonate of magnesia.

Closely connected with the use of alkalies in gout is the employment of **mineral waters.**

There is one thing which strikes one forcibly in approaching this subject, and it is that nearly every kind of mineral water that exists has been recommended in the treatment of the gouty constitution—the carbonate of soda waters of Vichy, the chloride of sodium springs of Homburg, the sulphate of soda waters of Carlsbad, the lime waters of Contrexéville and Bath, the sulphur waters of Harrogate and Aix, the indifferent thermal waters of Buxton and Gastein, and even the iron waters of St. Moritz; while there are a vast number of other springs, like those of Royat, which base their claim to be considered as remedies for gout upon the salts of lithium they contain.

If each of these springs, so different in composition, is of value in the treatment of gout, we should naturally look for certain conditions common to them all. These are:—1. The quantity of water, more or less pure, taken into the body under regulated conditions daily. 2. The altered mode of life, the regular exercise in the open air, the modified diet, the early hours, the absence of business cares. 3. In many foreign spas there is the drier and hotter Continental climate. 4. The stimulating effect to excretion and "tissue change" which the baths, douches, frictions and manipulations applied at most of them induce.

These are conditions, and not unimportant ones, common to most mineral-water cures; and in the "indifferent thermal" springs which are chiefly applied to the relief of the chronic joint affections, deposits, deformities, and loss of muscular power dependent on gouty inflammations, the thermality and modes of application of these hot springs are probably the chief operative agents.

We can only here refer very briefly to the chief of these resorts.

1. Vichy may be taken as the type of purely alkaline waters, its chief and all-important constituent being sodium bicarbonate (Vals, Ems, Neuenahr, Apollinaris are of the same character).

Durand Fardel, after more than forty years' experience at Vichy, satisfied himself that its springs "are extremely efficacious in gout." In gout, he says, it should only be employed in the intervals between the attacks. He considers its good effects to be attributable to the influence of the soda in promoting a normal and regular nutritive metabolism. He denies that it exercises any debilitating influence, as was asserted by Trousseau, unless it is improperly and injudiciously applied.

The cases best suited to Vichy are gouty dyspeptics, fairly vigorous, with a tendency to pass acid urine, with deposits of urates and uric acid, or with temporary attacks of glycosuria.

2. Carlsbad is one of the special resorts of the gouty. Its waters are hot, but of varying temperature, and contain considerable quantities of sodium sulphate, sodium bicarbonate, and sodium chloride. It is a common error to regard these waters as very "lowering" purgative springs. They are no doubt aperient, but when properly administered only gently so, and it

is often found necessary at Carlsbad to add a teaspoonful of the Carlsbad salts to the first glass of the water to ensure an action of the bowels. These springs have a remarkable action on the liver, and they have been especially utilised in the treatment of the gouty constitution when this is associated with hepatic congestion, hæmorrhoids, and "abdominal plethora." Dr. Kraus asserts that he has found its waters "indicated in all cases of gout," and their use "attended with the most remarkable results." He specifies, however, those cases in which vascular and renal degenerations have set in, as well as the weak and debilitated, as requiring very careful supervision. We should not ourselves advise any regular mineral course in such cases; it is exceedingly undesirable to surcharge with water, even for a short time, the vascular system when it is the subject of degenerative changes. Dr. Kraus states that *recent* gouty deposits "will generally disappear during or soon after the use of the Carlsbad waters, but that they have no influence over chronic indurations." We regard the Carlsbad course, when accompanied (as it is) with the employment of the hot mineral or mud baths, as exceedingly valuable in promoting elimination by all the chief excretory organs of the body, skin, kidneys, and intestines, and that in this way it stimulates normal nutritive metabolism and promotes the discharge of the waste products of imperfect metamorphosis.

3. We have a large and important group of springs in which the chlorides, and especially the chloride of sodium, are the chief ingredients. Leamington in England, Homburg and Kissingen on the Continent, may be taken as examples of cold springs of this class; Nauheim and Wiesbaden of hot ones. The hot springs of this class are generally admitted to be valuable in chronic rheumatic conditions, but there is some hesitation in admitting their utility in gouty states. In the treatment of gouty articular deposits, Ebstein and others estimate highly the hot springs of Wiesbaden, applied as baths, and also

drunk hot. Ebstein quotes the experiments of Pfeiffer to show that the water of Wiesbaden greatly increases the renal excretion and the quantity of urea excreted.

Homburg and Kissingen are especially applicable to chronic dyspepsias, to gastric catarrhs in gouty persons, whose gout, however, does not assume a very serious aspect. The waters are diuretic and slightly aperient; they are considered to "promote tissue change," to promote elimination also, to check the tendency to obesity, and to "ward off" the more serious gouty affections.

4. The most difficult waters to comprehend are those earthy waters containing chiefly sulphate and carbonate of lime, like the cold springs of Contrexéville. We have visited personally most of the important spas of Europe, and have remarked that the springs at nearly all of them are administered by the physicians who practise there in moderate and sometimes in quite small quantities. But it is quite otherwise at Contrexéville; there the glasses hold each about twelve ounces, and as many as eighteen glasses a day are occasionally ordered by the physicians, and over-zealous patients will occasionally add half-a-dozen more on their own account!

One of the objects of passing this large quantity of fluid through the urinary passages is, no doubt, to mechanically dislodge and carry away calculous deposits lodged in the kidneys; and, indeed, the success which frequently attends these efforts is remarkable. But is it possible that this water exercises any solvent effect on the surface of these calculi, or on uratic deposits in the system? We were assured by the able physicians in practice there that in gouty persons large quantities of uric acid are excreted during, and sometimes for a long time after, the course.

Another interesting point about the use of these sulphate of lime waters is the decidedly purging effect they often exercise at Contrexéville. This is at once apparent by the abundant provision made for such a consequence. Is this the result of the mere overflow and passage through the intestines of undigested water, as is maintained by practitioners at rival springs? Or is it that this large quantity of water conveyed (when taken, as it is, in the morning fasting) immediately through the hepatic portal circulation stimulates a free secretion of an abundance of thin, very fluid bile, which acts as a quick purge when it reaches the intestine? Or is it that both these events happen? Several patients who were trustworthy observers assured us that their evacuations were distinctly "bilious," and not merely "watery."

5. The local treatment of gouty deposits, of gouty deformities, and gouty neuralgia, often attended with such marked advantage at such thermal springs as Buxton, Gastein, Wildbad, Bath, and Aix, owes much of its success, no doubt, to the thermality of those springs, and especially to the frictions, douches, and manipulations there employed. And in the case of the indifferent springs, the ingestion of a certain amount of warm water daily acts, no doubt, as a useful solvent and eliminant.

6. The sulphur springs, as those of Aix, Harrogate, and Strathpeffer, find their appropriate application in those numerous instances of the gouty constitution which are accompanied with cutaneous eruptions, as psoriasis and eczema.

But one of the chief advantages to be derived from a course of mineral waters is, as we have already suggested, the quantity of that most important eliminative agent, **water,** that is ingested, and it is not necessary to resort to a mineral spring in order to consume an adequate quantity of this valuable solvent. No remedy is more valuable and important in the treatment of the gouty diathesis than the regular consumption of a considerable quantity of pure water, and preferably **hot water.**

As a diluent and solvent of renal excrementitious substances it is most useful, while in its rapid passage through the system it must dissolve and carry away waste matters from the blood and tissues. When drunk at a higher temperature than that of the blood the effect of this hot water flowing through the hepatic portal circulation is to stimulate the functions of the liver cells and promote biliary excretion. It thus responds fully to the foremost indication in the treatment of gout—*i.e.* "to promote the elimination of waste," while, by temporarily diluting the blood, it must tend both to favour the solution of uratic deposits and prevent their precipitation.

The subjects of this diathesis would do well to drink daily a teacupful of hot water on first rising in the morning, another half-an-hour before dinner, and a third the last thing at night.

In combining the regular application of hot baths of some duration (fifteen to thirty minutes) with the ingestion of hot water, as is the practice at most thermal stations, a powerful appeal is made to another *eliminating* organ, viz. the *skin;* and a further step is taken in carrying out the indication for evacuant treatment.

In short, all the measures that have been found by experience to be of value in the treatment of gout are directed to promote and hasten the complete metabolism of nutritive waste, and support the view that gout is essentially a morbid disturbance of "retrograde metabolism."

The preceding considerations have chiefly had reference to the remedial treatment of the constitutional state in the gouty, and of the more chronic manifestations of this disease; we must now consider briefly the treatment of an attack of **acute articular gout,** such as we have described at the commencement of this chapter. We have said that the gouty subject often feels better after an acute attack of regular articular gout than he may have done for some time previously, and an acute outbreak of gout in the great toe has occasionally been contemplated with a certain amount of satisfaction. "A gouty man, tormented with symptoms of irregular gout, is relieved by a regular arthritic attack. . . . This arises from the complete, or approximately complete, precipitation of the urates floating in his blood and lymph into the structures of the joints. The urates are thereby almost as effectually removed from the vital fluids as if they were eliminated by the kidneys" (*Sir W. Roberts*).

Ought we, then, to interfere actively in treating an acute attack? If our idea, in treating such an attack, be to redissolve the precipitated urates, and so restore them to the circulation, we should, unless we could at the same time ensure their elimination by the kidneys, apparently be rendering our patient a doubtful service, if the foregoing view of the nature of the articular attack be correct. No doubt we should pursue mainly an eliminative treatment, and afford further aid to the organism to throw off peccant substances in the blood that have led to the acute joint attack, and so we may prevent an excessive injury to the articular structures originally attacked, or obviate the involvement of more joints. For this reason we should avoid, if possible, the internal use of opiates, because of their tendency to check elimination. We must, however, especially have regard to the constitutional state of the patient, for treatment that would be most appropriate in a plethoric, robust subject might be wholly unsuited to a feeble, debilitated person, worn out, perhaps, by repeated acute attacks, or suffering at the same time from arterial and renal changes.

In a robust patient, with an uncomplicated attack of acute articular gout, we should administer moderate doses of colchicum in combination with an alkaline saline aperient. The following formula is a good one for the purpose :—

℞ Magnesii sulphatis	**℥jss.**
Magnesiæ levis	**ʒij.**
Potassii citratis	**ʒiv.**
Tincturæ seminum colchici	**ʒiv.**
Aquæ carui	**ad ℥viij.**

Misce, fiat mistura. Two tablespoonfuls, with two of hot water, every three hours until the bowels have been freely relieved.

After the bowels have been freely acted upon, the sulphate of magnesia should be omitted, and when the joint pain is to a great extent relieved the mixture should be given every six, instead of every three, hours; it will, however, be found useful to continue to give a dose of the original mixture every morning, to maintain an aperient effect so long as the acute attack lasts.

If there should appear to be any reason for avoiding the use of colchicum, or should there be any counter-indication to the employment of aperients, such as the co-existence of an intestinal flux, we may use the following mixture of salicylates:—

℞ Sodii salicylatis	ʒij.
Lithii salicylatis	gr. xl.
Potassii citratis	ʒiv.
Tincturæ zingiberis	♏ xv.
Aquæ cinnamomi	ad ℥viij.

Misce, fiat mistura. Two tablespoonfuls every two or three hours until the pain is relieved, then every five or six hours.

If desirable, a pill, containing a moderate dose of colchicum, together with some aperient, may also be given at night, as well as the above mixture; as, for instance, the following:—

℞ Extracti colchici	gr. iij.
Podophylli resinæ	gr. j.
Pilulæ colocynthidis et hyoscyami	gr. xxiv.

M. et divide in pil. vj. One at night.

The best local treatment,* for the relief of the pain, is to pack the joint with a warm alkaline and opium lotion. A lotion, containing half an ounce of carbonate of soda in crystals and 2 drachms of laudanum, to 10 ounces of water, should be prescribed. A portion of this should be mixed with an equal quantity of hot water, and pieces of lint or soft linen, thoroughly wetted with it, should be wrapped freely round the joint, and some of the hot lotion poured over this dressing. The joint and dressing should then be enveloped in cotton-wool and covered with a layer of oil-silk. The foot should be raised a little and placed on a comfortable cushion or pillow. It is often remarkable how rapidly this application will relieve the pain in the joint.

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* Many local applications for the relief of the pain have been suggested, such as cocaine, ichthyol, menthol, camphor, chloral, and liniments containing morphine and belladonna, formulæ for which will be found at the end of the chapter.

We have already said that we do not approve of the internal use of opium if it can possibly be avoided; but in the feeble and debilitated, if the pain is excessively severe, and there is no renal disease, we may give 10 grains of Dover's powder, with half a dram of spirits of nitrous ether, in an ounce of camphor water occasionally. It is not often desirable to give morphine hypodermically. There is, however, no objection to a full dose of potassium bromide (30 grains), with tincture of hyoscyamus (half a dram), to procure sleep.

During the acute attack the diet must be light and fluid.

Warm drinks to promote the action of the skin are useful. We should, therefore, limit the food to hot milk and water, thin oatmeal gruel, whey, weak veal or chicken broth; and we see no objection to an occasional cup of weak tea, with a little dry toast, as this often proves very refreshing and grateful to the patient. Many gouty patients will be found to object to milk as indigestible, especially if undiluted; but this objection may often be overcome by diluting the milk (hot or cold) with twice as much Apollinaris or seltzer water.

During convalescence the diet should still be very carefully restricted. A little boiled mutton, or chicken and rice, or a grilled sole or whiting with sliced lemon, may be permitted once a day, and a poached or boiled egg with dry toast at breakfast. Beyond this only the light fluid foods already mentioned should be allowed. At this time a light bitter tonic, with some alkali, should be given twice daily, and we should be careful to see that the urine is maintained free from acid lithates, and that there is daily a free action of the bowels. The following mixture may be prescribed :—

℞ Potassii bicarbonatis	ʒij.
Sodii bicarbonatis	gr. lxxx.
Spiritus ammoniæ aromatici	ʒiv.
Infusi calumbæ	ad ℥viij.

Misce, fiat mistura. Two tablespoonfuls to be taken twice daily.

Any inflammatory thickening and impaired mobility left about the joint may require the application of iodine, or the rubbing in of the linimentum potassii iodidi cum sapone, together with gentle passive movements.

Some have advocated the treatment of the acute joint attack by quinine as an antipyretic, and in debilitated subjects we see no objection to the use of quinine in an effervescent alkaline mixture, according to a formula we have already given (vol. i., p. 609). Garrod has advocated a combination of quinine and alkalies in subacute cases.

In broken-down constitutions it may be needful to give a more generous diet during the acute attacks, such as beef-tea, clear soups, whipped eggs, in addition to gruel, milk, and other farinaceous foods; and a certain amount of stimulant, such as 2 or 3 ounces of cognac or old whisky daily, diluted with hot milk, may be allowed.

The appropriate treatment of the constitutional state during the intervals, and of cases of chronic gout, will be, to a great extent, gathered from what has preceded. We have referred to the value of such medicinal agents as colchicum, guaiacum, potassium iodide, the salicylates, the alkalies, and the various mineral waters; and suitable formulæ for some of these will be given at the end of this chapter. Ammonium phosphate, ammonium chloride, sodium phosphate, have also their advocates for the treatment of chronic gout. In what has been termed atonic gout, which we take to mean subacute and chronic gouty manifestations in feeble constitutions, stomachic *bitters* and aromatics were at one time highly esteemed (such as the Portland powder), and their use has been recently revived in the popularity of the *Pistoja* powders for the treatment of chronic gout. These powders are prepared at the "Pharmacy of the R. R. Benedictine Sisters," at Pistoja, in Tuscany.* Some gouty patients have assured us that they have derived great benefit from their use. A powder has to be taken daily, in "half a glass of cold water or tepid coffee two hours before breakfast," for a whole year without interruption. "The blood must be under the essentially depurative action of the medicines for four entire seasons." These powders are asserted to contain "no colchicum or belladonna or other poisonous substances," but are composed "of medicinal herbs, none of which can have a bad effect on the patient." They are known to contain gentian.

It is certain that the most important point in the management of the gouty constitution is to keep assiduous watch over the digestive and assimilative functions; vegetable bitters with alkalies are of the greatest service in this respect. They should be given about an hour before the two principal meals. The bowels should never be allowed to become constipated, and the urine should be frequently examined, as slight abnormal changes in this excretion often furnish the earliest signs of disturbed retrograde metamorphosis.

Finally, we must consider the **dietetic** and **regiminal** treatment of gout.

It is universally admitted that in the treatment of gout we must take largely into account questions of diet and mode of life. Apart from the influence of heredity, which is the chief etiological factor, no other cause is so influential in its production as habitual excesses or errors in eating and drinking; and, even when the hereditary tendency is strongly pronounced, very much may be accomplished by careful attention to dietetic rules, so as to keep in abeyance its more serious manifestations. It would, however, be a grave error to conclude that all the victims of gout merit the reproach of intemperance, or that they should all be submitted to the routine of a rigid abstinence.

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* Powders for a whole year (one daily) are supplied for 50 francs, and for six months for 26 francs.

The gouty should avoid a diet in which there is much fat or saccharine and starchy substances, on the grounds that by affording the system material for combustion, these substances tend to check the metabolism of nitrogenous compounds and prevent their complete elimination. We agree with Senator, who says there should be a minimum of fat. He objects also particularly to yolk of egg, on account of the amount of fat and *lecithin* (an abundant source of phosphoric acid) it contains.

Each patient requires to be studied separately, especially with regard to digestive peculiarities; and our object should be to construct a diet which shall be readily digested, and which does not tend to excite acidity, and undue fermentation in the alimentary tract; and *that* diet will differ with different persons. An excess of nitrogenous food (animal flesh) should be specially avoided. Races who are vegetarian feeders are free from gout. On the other hand, we are quite satisfied that in the present day we often encounter the neurotic manifestations of this diathesis in persons who are delicate feeders with small appetites, and who consume a minimum rather than a maximum amount of food.

It is most essential to insist that the constituents of each meal shall be simple and of like nature and mode of digestion. One meal should be composed almost exclusively of nitrogenous food, another of fats and carbohydrates, and another of fruit, at proper intervals, and they will all agree and be suitable; but the contrary will be the case if they are mixed together in the same meal, one hindering the digestion of the other. Ripe and cooked fruit *taken alone* will be found beneficial to many gouty persons; but it should not be mixed with other kinds of food, for then it will disturb and delay digestion, and with many gouty patients fruit of all kinds disagrees!

A most important question in connection with the management of the gouty diathesis is the use of alcoholic drinks. In some persons, and especially in women, it is best to avoid them altogether; in others their moderate and discriminating use is not injurious. Of all alcoholic beverages, malt liquors are most prejudicial in this diathesis, and bad-quality wines. With regard to wines, it is not the name but the quality of the wine which is important; and no greater error has ever crept into medical practice than that exceedingly common one of advising everybody to drink light claret. A more injurious beverage than bad claret, or imperfectly matured claret—and, speaking generally, all but the more expensive or most carefully selected clarets are bad—was never drunk.

The wines which act freely as diuretics are the wines which agree best with all persons. In some this will be champagne, in others claret, in others hock, and so on.

A very eminent physician of New York told us that he found champagne and port—carefully selected—the best remedies for *his* gout. We have certainly known many gouty persons who found champagne the wine that suited them best. But it will also happen that gouty persons who have drunk champagne with impunity for many years will suddenly find that it provokes some form of goutiness which disappears on relinquishing the use of this wine. For those who find a certain amount of wine a necessity, it is advisable that they should add to the wine they drink a small quantity of an alkaline water.

Still Moselle mixed with Apollinaris water is a good summer drink for thirsty persons who require a "big drink."

For others 2 or 3 tablespoonfuls of old whisky or good cognac daily, freely diluted with water, may be permitted. But it is undoubtedly better for the gouty person to abstain entirely from alcohol if he can do so with comfort.* We have already insisted on the advisability of a free consumption of water by the gouty.

A great deal has been said about the importance of **exercise** for gouty persons, and no doubt a sufficiency of exercise is important to all persons. But gout is a disease which prevails amongst a class of persons who take a vast amount of physical exercise, and often of a very energetic kind, and so produce a large amount of nitrogenous waste. Moderate, regular, out-of-door exercise should certainly be inculcated, but excessive exercise we think injurious.

The comparatively slight incidence of gout in women as compared with men, who lead much more active lives, points in the same direction—viz. that want of exercise is not such an important factor in the etiology of gout as has been imagined. A due relation between food and exercise should, however, be observed; women who take comparatively little exercise as a rule eat much less than men, and all those who find it impossible to take an adequate amount of exercise daily must restrict their intake of food accordingly.

As to **climate**, we are convinced that a climate that is warm, dry, and equable is most advantageous to the subjects of this diathesis, and that climatic conditions which interfere with the free action of the skin are most prejudicial. It is a matter of common observation with patients themselves that if the action of the skin gets disturbed by the onset of a cold east wind they soon begin to feel "gouty."

When there is a tendency to renal changes, or to recurrent attacks of subacute gout, it is advantageous, when possible, for such patients to winter in a warmer, drier, and more equable climate than that of England.

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* For a fuller examination of the subject of diet in gout, *see* the author's work on "Food in Health and Disease," part ii., chap. v.

ADDITIONAL FORMULÆ.

For acute gout.

℞ Vini colchici, ʒj.
Magnesii carbonatis, gr. xv.
Aquæ cinnamomi, ℥j.

M. f. haustus. To be taken at bed-time. (*Brande.*)

Anti-gout tincture.

℞ Tincturæ semin. colchici, ℥j.
Tincturæ radicis aconiti, ʒij.
Tincturæ guaiaci, ℥ss.
Tincturæ quininæ, ℥ss.

M. f. tinct. Thirty drops in a glass of ash-flower tea three times a day.
(*Dujardin-Beaumetz.*)

Mixture for chronic gout.

℞ Potassii iodidi, ʒij.
Potassii bicarbonatis, ʒvj.
Vini colchici, ʒj.
Aquæ camphoræ, ℥xij.

M. f. mist. A tablespoonful three times a day in a wineglassful of water after meals.
(*Whitla.*)

Mixture for the gouty diathesis.

℞ Lithii hippuratis, ʒj.
Syrupi aurantii, ℥j.
Aquæ ad ℥vj.

M. f. mist. A tablespoonful in water at bed-time.
(*Prof. Stewart.*)

Mixture for acute gout.

℞ Tincturæ radicis aconiti, ʒss.
Morphinæ sulphatis, gr. ij.
Antimonii tartarati, gr. j.
Syrupi zingiberis, ℥ss.
Aquæ ad ℥ij.

M. f. mist. A teaspoonful every three hours.
(*Prof. Gross.*)

Pills for the gouty diathesis.

℞ Extracti maidis stigmatæ, ʒjss.
Sodii benzoatis }
Lithii carbonati } āā gr. xl.
Olei anisi, guttæ iij.

M. et divide in pil. lx. Take two before meals thrice daily for twenty days in each month.
(*Huchard.*)

Gout pills.

℞ Extracti colchici acetici, gr. xviij.
Extracti colocynthidis compositi, gr. xviij.
Pulveris ipecacuanhæ compositæ, gr. xviij.

M. et divide in pil. xij. One night and morning.
(*Halford.*)

Pills in gout.

℞ Extracti colchici acetici, gr. vj.
Extracti rhei } āā
Extracti aloes socot. } gr. vj.
Extracti belladonnæ, gr. ss.

M. et divide in pil. vj. One twice a week at bed-time.
(*Garrod.*)

Liniment for acute gout.

℞ Morphinæ hydrochloridi, gr. x.
Linimenti belladonnæ, ℥iij.

M. et f. linim. A teaspoonful to be mixed with a tablespoonful of hot water, and applied on lint under oil-silk every four hours. (*Garrod.*)

Local application for acute gout.

℞ Atropinæ, gr. iij.
Morphinæ hydrochloridi, gr. xv.
Acidi oleici, ℥j.

Solve ut f. linim. To be painted over the painful joint with a large camel-hair brush, and the joint wrapped in cotton-wool. (*Duckworth.*)

Liniment in gout.

℞ Tincturæ opii, ʒvj.
Linimenti saponis, ℥ij.

M. f. linim. To be kept in contact with the affected joint on flannel covered with oil-silk. (*Prof. Gross.*)

Soothing ointment for acute gout.

℞ Extracti opii, gr. xlv.
Extracti hyoscyami, gr. xl. ad ʒj.
Adipis, ℥j.

M. f. ung. The painful joints to be anointed with this ointment and then covered with cotton-wool. (*Charcot.*)

CHAPTER III.

THE TREATMENT OF DIABETES.

Definition and Nature of the Disease—Temporary Glycosuria—Glycogenic and Sugar-forming Functions of the Liver—The Normal Glycolytic Process in the Body suspended or impaired in Diabetes—Also a "*Hepatogenous*" Form dependent on Disturbances of the Glycogenic Functions of the Liver—*Slight* and *Grave* Forms, their Clinical Characters—*Pancreatic* Diabetes—Symptoms and Course—Characters of Urine—Etiology—Treatment—Dietetic—Exclusion of Carbohydrates (Muscular Exercise)—Dangers of an Exclusive Dietary—Possibility of Modifications—Milk—Substitutes for Bread—Permissible Foods and Beverages—Mineral Waters—Carlsbad—Vichy—Neuenahr—*Hygienic* Treatment—*Medicinal* Treatment—Opium—Morphia—Codeia—Alkalies—Arsenic—Potassium Bromide—Antipyrin—Sulphonal—Sodium Salicylate—Aspirin—Jambul—Oxygen, etc. etc.—Pancreas and Pancreatic Extracts—*Treatment of certain Distressing Symptoms*—Thirst—Inflammation of Gums and Dental Caries—Constipation — Flatulence — Cutaneous Irritation — Cystitis — Diabetic Coma—Test Dietary—General Conclusions—Foods and Beverages Sanctioned and Forbidden. Additional Formulæ.

DIABETES may be defined as a disturbance of nutrition, characterised by the accumulation of sugar in the blood (*hyper-glycæmia*)* and its excretion in the urine, the amount of which is usually greatly increased. Although the pathology and etiology of this disease are still involved in obscurity, and the treatment is almost wholly directed to the control of one symptom, the glycosuria, it will be advisable to discuss, very briefly, one or two points connected with its pathology before we enter upon the consideration of its therapeutics.

In health the starchy substances, together with the sugar, of our food (carbohydrates), the former being converted into sugar in the processes of digestion, are, after absorption, ultimately wholly consumed and utilised in the body. None, or practically none, passes out of the body as sugar. In diabetes it is otherwise, and a more or less notable amount of sugar passes out of the body in the urine; and it has been found, by observation, that the amount of sugar passing out in the urine is usually proportionate to the amount of saccharine and starchy substances entering into the diet. Moreover, in one form of this disease, and that by far the *more serious*, sugar appears in the urine even when the food is restricted absolutely to albuminates and fats, and when carbohydrates are totally excluded. This sugar is formed at the expense of the proteids of the food and of the tissues.

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* The blood and lymph in health contain about 0·12 per cent. of dextrose.

In health, the sugar which is taken into or formed within the organism is, directly or indirectly, utilised in the production of force; in diabetes a greater or less proportion of it escapes from the body unconsumed.

The *occasional* and *temporary* presence of variable amounts of sugar in the urine, in certain persons, appears to have no serious import, and is ordinarily referrible to the consumption of an excess of saccharine or starchy substances in the food, and especially the former, so that sugar is added to the blood more rapidly, or in larger quantity, than can be fully stored up as glycogen, or consumed in the processes of nutrition. This is termed *non-diabetic* or alimentary glycosuria.

In health, then, sugar is continually being added to the blood in its passage through the liver, the greater part being derived from the carbohydrates of the food, which the liver has the power of converting into and storing up in its cells as non-diffusible glycogen, a fact long ago established by Claude Bernard. In this way the liver is regarded as acting as a regulator of the sugar-forming and sugar-consuming processes, storing up in its cells glycogen by conversion of the alimentary glucose reaching it in the blood of the portal vein, and then, by reconversion of this glycogen into sugar, providing a fixed and constant supply of sugar to the blood.

But Seegen asserts that we must recognise another regular supply of sugar to the blood proceeding from a *normal* sugar-forming function of the liver, at the expense of albuminates and fats. We shall see presently how these facts are applied to the explanation of the two recognised forms of diabetes, the *slighter* and the *graver* form.

The view formerly taught by Pavy, that the presence of sugar in the blood, in any but a very small and insignificant quantity, was morbid, and was the cause of sugar appearing in the urine, and that sugar did not undergo combustion in the capillaries, is no longer tenable. We have now returned to the view originally advanced by Claude Bernard, that the blood in health always contains a certain amount of sugar, which is consumed in the capillaries, in the normal processes of nutrition and force-formation, and is ultimately eliminated in the form of carbonic acid and water.

Glycosuria, then, will occur under either of two conditions—first, when sugar is added to the blood in quantity greater than can be consumed in the normal processes of nutrition; or, secondly, when the normal function of sugar destruction in the blood (glycolysis) is disturbed or arrested.

We may thus have diabetes dependent (1) on disturbances of the glycogenic functions of the liver, or (2) on disturbances of the nutritive (glycolytic) changes in the blood and tissues.

Seegen terms the first group "*hepatogenous*," and regards it as comprising the slighter forms of diabetes, and he suggests that it is due to an inhibition of the functional activity of the hepatic cells devoted to the formation of glycogen, the cause of this inhibition being unknown. In the production of the second and *grave* form, he maintains, the glycogenic function of the liver has no share. In this form the "whole organism, or a more or less considerable part of its elements, has lost the faculty of destroying the sugar of the blood."

The clinical characters and the prognosis differ greatly in these two forms, and from the difference in their physical appearance French physicians have roughly divided diabetic patients into (*a*) *fat* diabetics and (*b*) *thin* diabetics.

The diabetics of the first group are usually well nourished and *often fat*, with a fresh complexion and a moist skin. They rarely suffer from the ravenous hunger, the excessive thirst, and the extreme polyuria of the second group.

Those of the second group emaciate with great rapidity. Their skin is dry and rough, the face pale or slightly livid, their muscular power is reduced to a minimum, their hunger is insatiable, and their thirst and polyuria are excessive. The first form is usually seen in persons past middle age; the second form in the young. We must, however, be prepared to meet frequently with *intermediate* cases of very varying degrees of severity.

A further and most important distinction is that the diabetics of the first group lose wholly or partially their glycosuria, and the other symptoms associated therewith, on the withdrawal from their diet of all or great part of the carbohydrates; those of the second group, on the contrary, do not lose their glycosuria, even when restricted to an exclusively animal *régime*, although the amount of sugar excreted may be diminished. Occasionally, the first form may pass into the second.

They differ also gravely in prognosis. With a suitable regimen, and a cautious and careful mode of life, diabetics of the first group may continue to discharge the active duties of life, the natural term of which may be but little shortened; those of the second form, to whatever *régime* they may be submitted, rapidly lose all their strength, become utter wrecks, and a fatal issue as a rule rapidly supervenes.

To the second and grave form must be referred those cases of **pancreatic diabetes** to which the researches of Minkowski, Von Mering, and Lépine have directed special attention. Post-mortem examinations have shown that some exceedingly acute and grave forms of diabetes have been associated with serious structural changes in the pancreas, and many observers have proved, by experiments on animals, that extirpation of this gland is followed by a severe form of diabetes. But the extirpation must be *total*, for if but a small portion of the gland be left behind and the pancreatic duct be ligatured diabetes does not follow, and even the successful transplantation of a bit of pancreas under the skin of the abdominal wall, when the rest of the gland has been carefully removed, is sufficient to prevent the development of diabetes!

Lépine suggested that in the normal state the pancreas elaborated and poured into the blood through the lymph stream (not through its duct into the intestine) a *glycolytic* ferment which determined the destruction of sugar in the circulation, and the loss, from disease of the pancreas, of this ferment in the blood would necessarily lead to diabetes; more recently* he has modified this suggestion, and thinks it probable that the pancreas acts independently of its *internal secretion*, by destroying substances (? intestinal toxins) which, if absorbed, would interfere with and arrest the glycolytic function of the tissues. We cannot here pursue this interesting inquiry further, but it was necessary to call attention to these researches, as already therapeutic suggestions have grown out of them, to which we shall again refer.

The *chief* **symptoms** of the graver forms of diabetes are glycosuria, polyuria, excessive thirst, and hunger. The tongue is usually dry, red, and glazed; the skin is dry and harsh, the bowels are constipated. Great and rapid emaciation occurs in the younger subjects. Itching of the skin and irritation of the genitals, eczema, boils, and carbuncles are apt to occur. Slight albuminuria is frequent. Pulmonary phthisis is a common termination of the graver form in *young* subjects; and serious forms of pneumonia followed by gangrene of the lung are not uncommon. The same symptoms, but modified in the manner already referred to, occur in the slighter forms.

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* "Le Diabète et son Traitement," Paris, 1899.

Diabetic coma is a most serious complication, and leads to a fatal result in many of the younger subjects of this disease. Its mode of causation is obscure. The frequent presence in the urine of *acetone*, of *diacetic acid*, and of *β-oxybutyric acid*, and the fact that the alkalinity of the blood is greatly reduced and the acidity of the urine increased, has led to the suggestion that the presence in the blood of one or other of these is causally connected with the production of coma, and while it is admitted that a close relationship exists between these three substances, the majority of observers agree in thinking that β-oxybutyric acid or β-amido-oxybutyric acid is the cause of the condition, and as the latter has proved toxic to dogs whereas the former has not, Lépine* thinks the latter may possibly be formed in the blood by some intermediate process during the production of the former. On the other hand, seeing that the quantity of urine and of sugar excreted frequently diminishes prior to the onset of coma, and that albumen and casts appear in the urine, the opinion has been advanced that failure in the renal function and the formation and retention in the blood of some *toxic* substances, probably an acid, derived from decomposition of the sugar, is the cause of the coma. We shall see that the administration of alkalies seems to act as a remedy, although only a temporary one.

The **urine** in diabetes is usually excessively abundant; it varies, however, greatly in amount; in mild cases it may reach from six to ten pints, and in severe cases even to thirty and forty pints, daily. Occasionally we find the quantity of urine scarcely at all augmented. The density is usually high, but not always so, and we must not conclude that a urine is free from sugar because it is of low density. The specific gravity of the urine in diabetes ordinarily fluctuates, according to the amount of sugar it contains, between 1025 and 1050. The amount of sugar in the urine may vary from a mere trace up to as much as nearly 50 grains in the ounce, and the total amount excreted in twenty-four hours may range from a few grains up to twenty or thirty ounces! Diabetic urine is pale and clear, and does not deposit urates on cooling.

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* *Semaine Médicale*, Nov. 21st, 1900.

The division of diabetics into three groups (1) *slight* cases, (2) cases of *moderate severity*, and (3) *grave* cases, is convenient, and is based on practical observation.

In the first group, with a dietary from which all carbohydrates are excluded, the sugar usually disappears entirely or almost entirely from the urine, and the patient's health is scarcely at all impaired. Such patients often belong to the gouty type; they are often fat, and although, before dieting, they may be passing several ounces of sugar daily in the urine, if put on a strict diet, after a few days the glycosuria will disappear; but a return to the ordinary diet will be attended by a reappearance of the sugar in the urine.

In the second group, the excretion of sugar diminishes when a rigid diet is applied, but it does not disappear; the patient may continue to lose flesh and to look ill, and the polyuria, the thirst, the hunger, and the other symptoms are still present, though favourably modified by treatment. These cases are prone to be attacked by intercurrent maladies such as pneumonia or phthisis, and to pass into the third or *gravest* form. In this form, like the preceding, the excretion of sugar is not arrested by the strictest dietary, and these cases pursue a steadily downward course, no matter what treatment is adopted. Their urine often gives a dark brownish-red coloration with ferric perchloride, owing to the presence in it of diacetic acid (Gerhardt's reaction). This is an important sign as indicating the imminence of diabetic coma. In these grave cases the sugar excreted in the urine, when all carbohydrates are eliminated from the diet, must be formed at the expense of the proteids of the food and the tissues.

Certain facts have been made out with regard to the **etiology** of diabetes. Hereditary tendency appears in a decided manner in a certain proportion of cases; it has been observed to follow, in some cases, traumatic and other lesions of the nervous centres; it has apparently been traceable occasionally to emotional shock, anxiety, and mental strain; a racial tendency has been noted, especially in Hebrews; it is rare in childhood, and is most common between 30 and 60 years of age; it occurs far more frequently in men than in women; and the *gouty* diathesis is supposed to be a predisposing cause.

We must now pass from this necessarily brief sketch of the general features of the disease to the consideration of its treatment.

The **dietetic treatment** of the diabetic necessarily occupies the foremost place in their management. By diet alone we can arrest the glycosuria in many cases of the slighter form, and diminish considerably the amount of sugar excreted in others. At the same time we diminish also the thirst, the polyuria, and other symptoms.

The principle which governs the construction of a dietary for the diabetic is the elimination of all those articles of food which either contain sugar or substances that can be converted into sugar in the organism; in short, all food substances containing carbohydrates.

This is not, in all cases, easy, as we have to consider also how to maintain the nutrition of these patients at an average standard, and we must be careful not to enforce too rigorously a diet which is obviously impairing the general strength and nutrition of the patient. It is especially necessary to bear this in mind in treating the *graver* forms, as they do not tolerate well a highly nitrogenised dietary.

In the *fat* diabetics, the well-nourished and sometimes gouty types, we may prescribe with advantage the strictest alimentary regimen; but with the emaciated subjects of the grave form of this malady we have a far more difficult task, for not only have we to consider how we can arrest or check the excessive excretion of sugar, but also how we may best control the co-existing grave disturbances of general nutrition. It is universally admitted that the basis of a suitable dietary for diabetics is the entire or partial exclusion of carbohydrates and their replacement by albuminates and fats. Clinical observations also show that the amount of sugar excreted in the urine, so far as it is dependent on the diet, exercises a great influence on the well-being of the patient. The distressing thirst of the diabetic patient is determined by the amount of sugar in the blood, and we can only relieve the former by a diet which will also tend to diminish the latter.

Albuminates and fats, then, should form, as far as possible, the sole food of the diabetic, but some concessions will have to be made occasionally to the feelings and wishes, and sometimes to the real needs, of the patient. Moreover, the capacity for utilising sugar is not wholly lost in all cases, and patients have been found able, even in somewhat advanced stages of this disease, to metabolise a certain amount of carbohydrates.

Muscular exercise, within certain reasonable limits, with the object of promoting glycolysis, has been advocated by Bouchardat, Lépine, and others. But it must not be overlooked that, in the grave form, physical exercise is badly borne, and that its chief value is in the well-nourished group. Lépine is especially earnest in insisting on the risk involved in any excess of physical exercise. It should be prescribed with great caution and moderation, and care must be taken that the diabetic patient is never fatigued.* *Massage* is serviceable when exercise cannot be taken.

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* Lépine, "Le Diabète et son Traitement."

But apart from the tastes and wishes of the patients, there are certain physiological objections to a diet composed exclusively of meat and fats. It tends to aggravate the disposition observed in many diabetics to an increased excretion of the nitrogenous elements of the urine, and especially to the formation of uric-acid deposits, and in the grave cases a prolonged restriction from carbohydrates is dangerous, as it favours those changes in the blood which induce coma!

It is a good practical rule to test occasionally the capacity of our diabetic patients to metabolise certain carbohydrates, and we may, from time to time, discover individual peculiarities in this respect which will enable us to enlarge the dietary in that direction for a longer or shorter period. This would seem to be the case with regard to **milk**, as different physicians bear very conflicting testimony as to the value of this article of diet in diabetes. Scott Donkin maintained that he had succeeded by an exclusive (skimmed) milk diet in removing the sugar entirely from the urine of diabetics in a fortnight, and this is quite conceivable in cases of glycosuria in fat, gouty, over-fed persons. For them this would be an extremely limited dietary, cutting off *all excess*, from which excess probably *alone* the sugar in the urine was derived. Many authorities discard milk entirely from the diet of diabetics, and consider that it increases the amount of sugar in the urine. On the other hand, Bauer* considers it may be permitted in moderation, and Külz, with whom Lépine agrees, found that while some of his patients bore it badly, others tolerated it remarkably well. Sir William Roberts thought it less harmful to diabetics than might have been supposed, and would allow a limited supply, but considered it better to replace it by cream.†

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* "Dietary of the Sick," p. 296.

† Williamson prepares an artificial milk, practically free from sugar, made in the following manner:—Four tablespoonfuls of cream are well mixed with a pint of water and the mixture is allowed

Great practical difficulties arise in attempting to construct a dietary composed exclusively of albuminates and fats; the amount of fat needed to supply the quantity of carbon required in the system is with difficulty appropriated by the organs of digestion, and to attempt to supply the necessary carbon by albuminates alone would require a quantity of such foods altogether unmanageable. We are, therefore, driven to adopt a *mixed* diet, the various articles of which have to be chosen with special regard to the amount of sugar-forming substances they contain, selecting those which contain the minimum, and placing albuminates and fats as the chief nutritive elements of the dietary.

The ingenuity of physicians has been greatly taxed to produce a *bread* for the diabetic which may form an efficient substitute for ordinary bread, which is so rich in carbohydrates. *Gluten* bread, suggested by Bouchardat, supplies this need only moderately well; it is often carelessly prepared, and many samples are found to contain a considerable proportion of starch, and it is never entirely free from it; it is also dry and unpalatable. Gluten meal is also used for thickening broths and for making puddings. But it is desirable to test these preparations of gluten flour roughly with tincture of iodine before recommending them, as specimens of so-called gluten flour have been found to contain as much as 25 per cent. of starch. Callard's brown diabetic bread and biscuits contain, however, only 6 per cent. of carbohydrate, and some of his gluten preparations are not unpalatable. *Bran* biscuits made according to Dr. Camplin's formula* are tolerably free from starch.

"Torrified" bread—made by toasting thin slices

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to stand in a cool place. At the end of twelve hours, when the fat of the cream has floated to the surface, it is skimmed off with a teaspoon and placed in another vessel, and to it are added water, the white of an egg, and a little salt. This makes a palatable artificial milk ("Treatment of Diabetes Mellitus," *Medical Chronicle*, August, 1901).

* *See* the author's "Food in Health and Disease," p. 417.

of ordinary bread before the fire until they are deeply and thoroughly browned, almost blackened, so that the starch and gluten are in great part destroyed by heat—is acceptable to many diabetics. Cakes made of almond meal, from which the sugar has been removed by washing with acidulated water, have been recommended by Seegen and Pavy. Williamson* gives the following instructions for making almond cakes: Mix four ounces of almond flour with a little water and German yeast, stand the mixture in a warm place for about 20 minutes (the yeast destroys the small amount of sugar in the almond meal). Add a beaten-up egg and a little water, and make the whole into a paste. Divide into cakes and bake for 15 or 20 minutes.

Protein flour is said to yield an excellent substitute for bread. Dr. Dawson gives the following recipe for making it:—Protein flour 4 ounces, ground almonds 1 ounce, baking powder half a teaspoonful, milk 1 ounce, one egg, and a little salt, beat together well; bake in a quiet oven about 20 minutes. Protein is composed of casein of milk, like plasmon, and the latter can be used in its place. *Soya* biscuits and bread were warmly recommended by Dujardin-Beaumetz and by some other physicians, but the taste is objectionable to many, and some of the biscuits have been found to contain much starch. *Cocoanut* cakes are made of desiccated cocoanut powder in the same way as almond cakes.

Ebstein advocated a bread for diabetics made of a patented gluten flour extracted by a new chemical process from wheat, and termed "*Aleuronat.*" It is composed almost wholly of vegetable albumen, with only 7 per cent. of carbohydrates and about 9 per cent. of water. He claims for it many advantages over other forms of gluten, amongst others that it can be transported to any climate without fear of decomposition or putrefaction.

Williamson has prescribed cakes composed of aleuronat, with cocoanut powder, as quite reliable, free from starch and sugar, and palatable to most diabetics. They are prepared by mixing 2 ounces of desiccated cocoanut powder into a paste with a little German yeast and water—this is kept in a warm place for about 20 minutes. Then 2 ounces of aleuronat are added, and afterwards a beaten-up egg, water, and a little solution of saccharine. The whole is well mixed, divided into cakes, and baked.

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* "The Treatment of Diabetes Mellitus," *Medical Chronicle* 1901.

It is best when practicable that these preparations should be made at home, as they are then much less expensive and more reliable.

Three new preparations have been recently introduced in Germany which Ebstein prefers to aleuronat; these are *ergon*, an albumen obtained from rice, *roborat*, from corn, and a *casein* biscuit.

All kinds of animal flesh and fat are permitted, (except liver) as well as preserved meats, when sugar has not been used to preserve them; also fish of all kinds, and eggs, cheese, butter, cream, and oil. No flour or starchy material must be used in cooking for the diabetic. Sardines in oil, pâté de foie gras, caviare, cod's roe—these and similar relishes are all permissible. Green and fresh vegetables and salads (dressed abundantly with oil) may be freely consumed—cabbage, spinach, sorrel, dandelion, lettuce, cucumber, watercresses, mustard and cress; and some physicians allow, in small quantities, green French beans, asparagus, celery, onions, and leeks.

All vegetables and fruits containing a large proportion of starch or sugar must be forbidden. Some authorities consider a moderate amount of fresh acidulous fruit permissible—such as gooseberries, currants, apples, etc.

The best test, however, of any article of diet is its effect on the urine, and with daily observations of the urine it is easy to determine individual peculiarities in this respect. We should also weigh our patients frequently, so as to observe the effect on their general nutrition of the dietary adopted.

The diabetic patient suffers much from thirst, and it is therefore a question of some importance *what he may drink.* Alcoholic beverages should only be allowed in small quantity, as the temptation to excess is great. There is, however, no harm in a little non-saccharine wine, such as claret, hock, or still Moselle, diluted with water or with some effervescent alkaline water; or small quantities of whisky, brandy, or dry gin, largely diluted, may be substituted if required.

When the food contains much fat a little alcohol, taken at the same time, appears to aid its digestion.

There is no objection to light infusions of tea, coffee, maté, or kola, and these may be sweetened with a little saccharine.

The **food indications** may be thus summarised:—1. Avoid, or reduce to a minimum, all substances containing starch or sugar. 2. Give as much animal food—meat of all kinds—as can be comfortably digested and assimilated, so long as it agrees with the patient. 3. Replace the discarded carbohydrates by suitable substitutes from amongst the various animal and vegetable fats and oils. 4. In the stout and well-nourished, encourage muscular exercise to consume the excess of sugar in the blood; but do not push this to the extent of producing fatigue, which is injurious. By these dietetic measures the symptoms of all but the gravest forms of this disease may be ameliorated, while those of the slighter forms, together with the glycosuria, wholly, or to a great extent, disappear. But it would be an error to conclude that these cases, save in quite exceptional instances, are *cured.* A return to ordinary diet with a full supply of carbohydrates will usually be attended with a return of the glycosuria, and such persons have to continue a more or less careful observance of the regimen we have sketched for the rest of their lives.

It has, however, been pointed out that it occasionally happens that the nutrition of a diabetic patient will improve on the addition of a little carbohydrate to his dietary, although at the same time an increased amount of sugar may be passed in the urine. This is due to the albumen-sparing action of the carbohydrates, so that they lessen nitrogenous metabolism, in diabetics of a severe type. The diabetic rules must therefore not be made too absolute, as it will happen, now and then, that the addition of a little ordinary bread to the dietary will be attended by an increase in weight, and an improvement in nutritive condition, in certain cases, while with some patients a great excess of animal food is badly tolerated. We must be on the alert to note such peculiarities.

Next, perhaps, in importance to treatment by diet is treatment by **mineral waters.** The efficacy of certain mineral springs in the treatment of some forms of diabetes is well known to practical physicians. The alkaline, the alkaline and aperient, and the alkaline and arsenical waters are those chiefly employed. Neuenahr, Vichy, Carlsbad, and Bourboule may be taken as types of these. In what precise manner they act it is difficult to say, but there can be little doubt that alkalies do exercise an important influence over nutritive changes. With regard to Carlsbad, Professor Seegen, who practised there many years, and had seen more than a thousand cases, testifies that the Carlsbad course is of real utility, but only in the *slighter* forms of the disease, not in the *grave* form. He considers the Carlsbad water acts by augmenting and maintaining for a time the tolerance of starchy foods, and that this may be explained by a special action on the hepatic cell, which under its influence recovers the faculty of utilising the starchy substances ingested. "If we remember," he says, "that the Carlsbad water certainly exercises a favourable action on all the functions of the liver, it will not seem extraordinary that we should attribute to it an analogous influence on the slight form of diabetes—that is to say, on hepatogenous diabetes."*

Dr. R. Schmitz, of Neuenahr, published an account of the treatment of many hundreds of cases at that spa with excellent results. Our own experience extends especially to Vichy, Carlsbad, and Neuenahr, and we have observed most satisfactory results from treatment at these spas in all cases of diabetes, except those of the *grave* form, and we are not aware that any kind of treatment has ever done more than produce slight and temporary amelioration in the latter group of cases. Dr. Débout d'Estrées testifies to the value of Contrexéville water in the case of gouty diabetics. He says "stout diabetics" and "gouty diabetics" rapidly lose their glycosuria there.

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* "La Glycogénie Animale," p. 242.

The use of certain of these alkaline waters should enter into the daily regimen of diabetic patients. They tend to diminish the excessive thirst and the distressing dryness of the mouth, and to lessen the frequency of micturition and to allay cutaneous irritation. If we prescribe the stronger alkaline waters such as Vals or Vichy we may order from 3 to 6 ounces to be drunk half-an-hour before each meal; but the weaker waters, such as Apollinaris or Ems water, may be taken in larger quantity, and may be used to mix with wine.

It is of great importance to protect the diabetic patient from any depressing influence, and from exposure of all kinds, as it is well known he bears any pulmonary or other attack of intercurrent disease badly. He should therefore be warmly clad, and should avoid any risk of chill from exposure to inclement weather. He should be protected from worry, fatigue, and strain of all kinds—emotional, intellectual, and physical. It is an advantage, when practicable, to pass the winter in a sunny, dry, and sheltered locality.

With respect to the utility of **drugs** in diabetes, it must be borne in mind that, in the lighter cases, the disease can be kept entirely under control by means of such dietetic and general measures as we have already set forth, and that drugs are not needed. We are not, of course, alluding to occasional aperients, antacids, or simple remedies of like nature. We would also point out that no method could be more misleading than that of prescribing drugs as remedies for the diabetic state *at the same time* that we are applying a rigorous dietary, unless we have first ascertained that the amount of benefit to be derived from dietetic treatment is limited; otherwise we run the risk of attributing to the use of the drug benefits that may be wholly due to the diet. We should first, then, ascertain to what extent the symptoms are amenable to diet, and when we find that the most rigorous diet only leads to a moderate or small diminution in the quantity of the sugar excreted in the urine, we may fairly have recourse to drugs, and may reasonably attribute to them such amelioration as can be observed to follow their employment.

The only drug that has gained universal acceptance in the treatment of diabetes is **opium.** Some give the preparations of *opium* itself, and think them preferable; others give morphia; and others, including Pavy, give codeia. Seegen found morphia and Carlsbad water the two most efficacious remedies in diabetes, and he testifies that morphia incontestably diminishes the amount of sugar excreted in the urine in both forms of the disease. Although Pavy maintains the superiority of codeia, which is less constipating than morphia, and disturbs digestion less, Frazer, Bruce, Osler, and others consider the latter the most suitable and most efficacious remedy. Codeia should be given at first in small doses, $\frac{1}{2}$ grain three times a day, and this dose may be increased gradually to 4 or 5 grains thrice daily; or the watery extract of opium may be given in much the same dose as codeia. If we use morphia, we must begin with a smaller dose, $\frac{1}{6}$ grain thrice daily, and slowly increase it, if necessary, to 1 grain three times a day.

Diabetic patients tolerate large doses of opiates remarkably well, and large doses are often needed in order to produce any decided effect; but we do not approve of giving them in a routine manner, and we consider, as we have already indicated, that they should be reserved for those cases that cannot be effectively controlled by diet. In the *graver* forms they no doubt serve a useful purpose; together with a careful diet, they seem to hold the disease in check. How they act is not known. Recent observations would seem to show that they are especially adapted to hinder the production of sugar when it takes place at the expense of the proteids.* Their quieting effect on the nervous system may be important.

The effect of opiates must, of course, be carefully watched, and on observing any untoward effects, such as drowsiness, great loss of appetite, or disturbed digestion (these rarely occur when codeia is given), they must be withdrawn or greatly reduced in quantity. They are rarely indicated when albuminuria complicates glycosuria, and, if given, should be administered with great caution. Williamson objects to their constipating effect, especially in very severe cases, as constipation appears to increase the tendency to coma. He has found heroin hydrochloride (the new derivative of morphine) less constipating, and in some mild cases in which he gave it he thought it beneficial, but in others it caused severe vomiting (probably from an impurity in the drug).

Of the value of **alkalies**, as represented by alkaline mineral waters, we have already spoken, but they may also be prescribed in the form of medicines, and often with great advantage. The amount of sugar in the urine has been observed to diminish steadily under alkaline treatment. It is possible they may exercise a favourable influence over the hepatic and nutritive functions. Experimental observations seem to point to their exercising a twofold remedial action, viz. promoting glycolysis in the blood and tissues, and retarding the conversion of glycogen into sugar in the liver.†

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* Lépine, "Le Diabète et son Traitement," p. 53, Paris, 1899.

† Lépine, *op. cit.*, p. 56.

The bicarbonates of sodium and potassium have been largely employed, and so also have the citrates and tartrates. Of their influence, in large doses, in the prevention and temporary relief of diabetic coma we shall again have to speak.

Arsenic has been said to inhibit sugar formation in animals, and the *bromide of arsenic* has enjoyed a considerable reputation, especially among certain American physicians, in the treatment of diabetes. A 2 per cent. solution is used, and the dose is 1 minim, gradually increased to 5 minims, given after meals, thrice daily. It is said to diminish thirst and polyuria, to lessen the glycosuria, and to be particularly serviceable in cases of a neurosal type. Fowler's solution has also been given in large doses up to 12 or 15 minims, according to the tolerance of the drug. Professor Tyson* is an advocate of this treatment, but he does not give these large doses; he finds that much benefit in certain cases attends the use of Fowler's solution in 4-minim doses, twice a day. Professor Renaut of Lyons gives sodium cacodylate, by rectal injections, in the dose of 2 or 3 centigrammes daily.

Potassium bromide, 15 to 30 grains daily, given in association with alkalies, has been credited by several trustworthy observers with the power of causing the sugar to disappear from the urine; others, however, object to its use on account of its depressing effects, or insist that its administration should be limited to those cases in which nervous irritability is a prominent symptom, and in which there exists a certain amount of physical vigour to support the lowering influence of this drug. Lépine doubts its utility except as a nervine sedative. The sodium bromide may be combined with a nervine stimulant as the ammoniated tincture of valerian. Valerian itself was a favourite remedy with Trousseau for polyuria.

Antipyrin and other allied antipyretic drugs have been advocated by the French school as remedies for the polyuria and the glycosuria. A diminution of the amount of urine and sugar excreted has been observed to follow the exhibition of antipyrin in doses of from 10 to 15 grains thrice a day. Lépine thinks it a valuable remedy in the nervous form of diabetes, and that the action, probably through the nervous system, is to prevent the formation of sugar. Osler also thinks its use satisfactory in the same class of cases. It is, however, a medicine to be avoided when there are any signs of renal irritation, as some observers have imagined they could trace the occurrence of albumen in the urine to its use.

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* Hare's "System of Practical Therapeutics" (second edition), vol. i., p. 671.

It has recently been reported that *sulphonal* gives better results than antipyrin. It should not be given in doses of more than 30 grains a day, as larger doses have been found to cause great somnolence and vertigo.

Sodium salicylate has recently found a warm advocate in Williamson.* In a number of mild cases he has found it cause a considerable diminution in the amount of sugar excreted, although the diet has been kept exactly the same. He admits, however, that it is of little use in the severe form, and is without influence in certain of the mild cases; we may therefore probably conclude with Professor Tyson that it is chiefly useful in the gouty and rheumatic cases.

Williamson begins with 10-grain doses three or four times a day, and gradually increases them to 15 grains four or five times daily. He watches carefully for toxic symptoms, and discontinues the drug if they occur. He prefers the *natural* salt. He has also tried *aspirin* as a substitute for sodium salicylate, and is pleased with the results, and thinks it may be preferable in some cases.

Lépine thinks that *quinine* and *salol* should also be kept on the list of anti-diabetic drugs.

Most diverse reports have been made as to the efficacy of **jambul** in the treatment of diabetes.

Professor Colasanti, of Rome, and Lépine report experiments which show that it has some influence in hindering the production of sugar. It has been suggested that those who have reported against it as worthless have worked with specimens of inferior quality, or have not given sufficiently large doses. The dose of the liquid extract is $\frac{1}{2}$ dram to 2 drams. Larger doses have been given.

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* "Treatment of Diabetes Mellitus," *Medical Chronicle*, August, 1901.

Uranium nitrate, in doses of 1 to 5 grains, has been given by S. West and others in cases of diabetes, and excellent results have been reported. We have tried it in moderately severe cases, but without any notable effect. A French *pharmacien*, who states he was himself cured of diabetes by this drug, has introduced a "*vin urané Pesque*" containing uranium nitrate, bromide of lithium, pepsine, quinine, etc., mixed with Médoc, and claims good results from its use. It should be borne in mind that in the *slight* cases many remedies appear to be of use, but it is for the *grave* cases we need a remedy, and that remedy has not yet been found.

Numerous other drugs have been given in diabetes, with temporary benefit and occasional relief of some of the symptoms; but their introducers have not succeeded in obtaining for them more than a brief popularity. *Inhalations of oxygen* have been warmly advocated, but Lépine considers they are only of use in exceptional cases, and he prefers the permanganate of potassium as an oxidising agent, which he has found useful in the treatment of fat diabetics. He also recommends the bin-oxide of manganese, as it can be given in large doses.

The recent researches into the relation between diabetes and disease of the **pancreas** have led to some therapeutic suggestions which we must briefly notice. Sheeps' and calves' pancreas have been given *raw;* the pancreas of the ox has been given roasted; minced pancreas, infused in a suitable solution, has been administered by rectal injection; an extract in glycerine and water has been given hypodermically; pancreatic juice has been given in the same way. Lépine reviews these reports fully,* and comes to the conclusion that they are not convincing, and that no remarkable success has followed pancreatic treatment. Williamson has arrived at the same conclusion. "Clinically," he says, "pancreatic preparations have generally been useless."† Van Noorden is, however, reported to have made some observations which show that *fresh-scraped pancreas* lessens generally the loss of fat in the food of some diabetics. In a diabetic man aged 50 the steatorrhœa disappeared when he consumed 50 grammes of scrapings of calf pancreas several times a day. The expressed juice of the pancreas (100 to 125 grammes per diem) had nearly the same result, but was not so efficient.

Hepatic extract has also been given in several cases, but Lépine reports that in most instances the results were insignificant.

Certain **distressing symptoms** associated with this malady may call for remedial treatment. The *excessive thirst* will, of course, be diminished by whatever lessens the polyuria, or the amount of sugar in the blood; but when we fail in this, or only partially succeed, we must minister directly to the relief of this distressing symptom. There is no good reason why the patient should not drink freely of water; indeed, it is rational to expect that by adding to the blood considerable quantities of pure water we shall help to prevent the undue accumulation of sugar in the circulating fluid, as well as minister to the relief of thirst.

Lépine has wisely said that the diuresis is a "means of defence to the diabetic," and the free consumption of water favours that "defence."

We should arrange, however, that large draughts of water should precede and not immediately follow a meal, so as not to dilute too greatly the digestive ferments. The addition of a few drops of phosphoric acid, or of lemon-juice, or of a solution of bitartrate of potash to the water may be made if it is found to allay the thirst better; but nothing will clean and refresh the mouth so much as some weak alkaline water. The *dental caries and inflammation of the gums* so common in diabetics, from the morbid fermentations set up in the saccharine secretions in the mouth, are also beneficially affected by weak alkaline drinks.

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* "Le Diabète et son Traitement," Paris, 1899.

† Note on "Pancreatic Preparations in the Treatment of Diabetes Mellitus," *Practitioner*, April, 1901.

An alkaline and antiseptic mouth-wash should be used frequently. Listerine may be employed for this purpose, or 2 drams of borax, 1 dram of boric acid, and 1 dram of potassium chlorate may be dissolved in 1 pint of camphor water for a mouth-wash.

The intense craving for food and sense of *sinking* in the epigastrium, experienced by some patients, are relieved by 2 or 3 grains of asafœtida in a pill two or three times a day.

Constipation may require an occasional or even a daily aloetic pill, followed the next morning by a glass of Carlsbad or half a glass of Apenta water. Flatulence and intestinal catarrh, from abnormal fermentation in the bowels, are best relieved by an initial aperient, together with a dose of creasote or thymol in a pill twice or thrice a day, after food; or the *salicylate of bismuth* may be given if there is a decided tendency to diarrhœa. Schmitz, of Neuenahr, thought this drug of much value in the mild forms of diabetes. It may act favourably as an intestinal antiseptic.

Intense itching of the skin and great irritation about the genital organs from the repeated contact of saccharine urine require attention. The surface of the body should be frequently sponged with tepid water, and some absorbent material worn next the skin, such as thin flannel, which should be frequently changed. The genitals should be kept thoroughly clean, and some absorbent cotton-wool applied immediately after micturition. Eczema of the prepuce may require boric-acid ointment.

Cystitis, which occasionally occurs, is best treated by washing out the bladder with a weak solution of sodium salicylate, and by giving this drug, or salol, or boric acid internally.

The supervention of **coma** in the diabetic is one of the most serious symptoms we can encounter, and is almost always fatal. Some authorities think that the occurrence of coma may be prevented, in cases in which it is feared, by the frequent exhibition of saturated solutions of alkalies—such as 4 drams of sodium bicarbonate and 2 drams of citric acid dissolved in 5 ounces of water and flavoured with a little saccharine and essence of lemon. This should be taken twice or thrice daily.

Those who believe the coma to be due to the absorption of toxines from the alimentary tract advocate free purging. Dr. Richard Schmitz, of Neuenahr, used to give one or two tablespoonfuls of castor oil every hour; this brought away foul, black evacuations, and recovery, he said, often followed. Much, however, must depend on very early treatment, as soon as the first symptoms of such intoxication appear.

Williamson believes the alkaline treatment, although it may not have much influence on sugar excretion, has a decided action in preventing diabetic coma. He gives very large doses of sodium bicarbonate, 200 to 400 grains a day, in large quantities of water, soda-water, or milk, drunk in small quantities at frequent intervals. Saline purgative waters of the Apenta type should be given regularly at the same time to maintain free action of the bowels. If the pulse is very feeble, small doses of digitalis should be given, and strychnine may be useful. When coma is commencing he has given as much as 900 grains of sodium bicarbonate in twenty-four hours. Subcutaneous or intravenous injection of alkaline fluids has been carried out in many cases of actual coma with the object of diluting the blood and restoring its alkalinity. Normal salt solution has been used in the same way. Oxygen inhalations have also been used, but the alkaline and saline injections have given the best results, though the improvement is usually only temporary. Intravenous injection is preferable to the subcutaneous method. The following solutions have been used for this purpose, besides the normal salt solution, viz. a 3 per cent. solution of sodium bicarbonate in water; a solution of 10 grains of sodium bicarbonate, and 7 grains of sodium chloride in 1 litre of sterilised water. A large quantity, from 60 to 80 ounces, should be used, and the temperature should be about 100° to 101° F.

Schwarz reported that he had obtained a diminution of acetone and diacetic acid in the urine by giving *glyconic acid* neutralised by sodium bicarbonate; and Mayer* has recently tried the effect of *urotropin* in a patient with signs of diabetic coma; 20 to 60 grains were given daily, and several attacks were thought to have been thus averted, but the drug had to be left off on account of nocturnal diuresis, and the improvement was not maintained, the patient dying after the fifth attack. Lépine advises reliance being placed on (1) alkaline medication, (2) the intravenous injection of salines, and (3) oxygen inhalations.

Finally, and to recapitulate, in dealing with individual cases of diabetes, it is important at first to determine to which group of diabetics the patient belongs—to the slight, the severe, or the intermediate group. For this purpose a rigid test diet from which all carbohydrates are absolutely excluded is often usefully applied. It should not, however, be applied to the very severe forms whose urine gives Gerhardt's reaction with ferric perchloride, as diabetic coma is readily excited in them, and they do not bear well a rigid diet, as we have already explained. But it is useful to be able to distinguish between the slight cases and the moderately severe ones. For this purpose we may employ the following test diet of *Van Noorden*:—

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* *Medical Record*, March 8th, 1902.

8 am.—Ham 3½ oz., 1 cup of tea, 1 liqueur glass of Cognac.
10.30 a.m.—2 eggs fried in 150 grains of butter.
12.30 p.m.—5 oz. of cold roast beef, mayonnaise made with the yolk of 1 egg and 1 spoonful of oil, raw cucumber with 75 grains of vinegar, 1 spoonful of oil, salt and pepper, 225 grains of Gorgonzola cheese, half a bottle of Moselle, 1 cup of coffee with 1 tablespoonful of cream.
5 p.m.—1 cup of tea, 1 boiled egg, 1 liqueur glass of Cognac.
7.30 p.m.—1 cup of bouillon with 225 grains of marrow, 3 oz. of boiled salmon, ¼ lb. to ½ lb. of green asparagus with 300 grains of butter, 1 oz. of smoked ox tongue, 3½ oz. of capon salad with 75 grains of vinegar and 1 spoonful of oil, half a bottle of Bordeaux.
10 p.m.—A liqueur glass of Cognac with seltzer water.

The above diet is about as free from carbohydrates as it is practicable to construct one. If after a few days of this diet the urine is found free from sugar, it is clear the case belongs to the slight group. Except as a test diet it is undesirable to submit any case at once to so rigid a diet as this It is best to approach it by a gradual exclusion of carbohydrates. If, when on this rigid diet, the patient still continues to excrete a certain amount of sugar in the urine, we probably have to do with one of the intermediate or moderately severe forms, and the degree of severity will be in proportion to the amount of sugar daily excreted. If in such cases we can by diet keep the excretion of sugar at or below 400 or 500 grains a day, and at the same time maintain the patient's weight and strength, there is little need of drugs; but when we fail to do this it may be desirable to have recourse to their aid.

Our guide must be not so much the amount of sugar in the urine as the general condition of the patient with respect to weight and strength. In the slight cases and with fat diabetics a fairly rigid diet may be maintained for some time, and then we may test the capacity for assimilation of sugar by the cautious addition of carbohydrates to the dietary, best, usually, in the form of ordinary bread. For it has been found in many cases that after the continuance of a rigid diet for a certain time the tissues recover, to a certain extent, the power of assimilating sugar. Each case then requires careful watching, and a frequent estimation of the amount of sugar excreted daily, and of the gain and loss in weight, and of the influence of variations in diet on both.

In the construction of diabetic dietaries the following foods and beverages are **sanctioned:**—

In any quantity.—Animal flesh of all kinds: preserved (smoked) meats, ham, tongue, bacon; fish of all kinds; crabs and lobsters (not the "pudding"); animal jellies, soups, and broths; aspic; eggs, caviare, cream, butter, fats, oils, and cheese; spinach, cooked salads, endive, lettuce, spring onions, cucumber, green asparagus, mustard and cress, watercress, sorrel, mushrooms; pickles (cucumbers, walnuts, and onions); nuts, except chestnuts.

In small quantity.—Cauliflower, carrot, turnip, white cabbage, green beans; *berries*, such as *strawberries, raspberries, currants;* also oranges.

Reliable substitutes for bread.

Beverages: in any quantity.—Water, soda-water; tea, coffee; *in moderate quantity*, Bordeaux and Rhine and Moselle wines; Austrian and Hungarian table wines. In short, all wines that are not sweet, and that contain only a moderate amount of alcohol.

In small quantities.—Milk; almond emulsion; brandy; lemonade, unsweetened.

The following are **forbidden:**—

Farinaceous foods of all kinds; bread, puddings, cakes, biscuits, etc.; sugar, potatoes, rice, tapioca; arrowroot, sago, groats, macaroni; parsnips, beetroot, beans, peas, large onions; sweet fruits, as grapes, cherries, peaches, apricots, plums, and all kinds of dried fruits; liver; oysters, cockles, mussels, the "pudding" of crabs and lobsters.

Beverages:—Port, champagne, and all sweet wines and beers, must, fruit wines and fruit juices and syrups; sweet lemonade; liqueurs; ice and sorbets; cocoa and chocolate; and milk in large quantities.

ADDITIONAL FORMULÆ.

Lithium pills for diabetes.

℞ Lithii carbonatis, gr. xxx.
Sodii arseniatis, gr. j.
Extracti gentianæ, gr. xv.

M. et divide in pil. xx. A pill night and morning.

(*Vigier.*)

Lotion for the itching.

℞ Sodii hyposulphitis, ℥ss.
Aquæ, ℥vj.

M. f. lotio. (*Osler.*)

Another.

℞ Acidi hydrocyanici dil, ʒj.
Glycerini, ℥j.
Aquæ ad ʒvj.

M. f. lotio. (*Dawson.*)

Infusion of eucalyptus leaves in diabetes.

Mr. Faulds of Glasgow reports remarkable results from giving twice daily an infusion of 60 grains of the dried leaves of eucalyptus globulus in 6 oz. of water, infused for half an hour in a teapot and a little saccharin added (*Brit. Med. Journal*, May 24th, 1902).

Iodoform pills for diabetes.

℞ Iodoformi, gr. xv.
Extracti lactucarii, gr. xv.
Cumarin, gr. jss.

M. et divide in pil. xx. One three times a day.

(*Moleschott.*)

Mouth wash for diabetics.

℞ Boracis
Potassii chloratis } āā ʒj.
Glycerini
Mucilaginis acaciæ } āā ℥j.
Aquæ ad ʒviij.

M. f. lotio. (*Packard.*)

Another.

℞ Boracis, ʒij.
Tincturæ myrrhæ, ℥ss.
Aquæ ad ℥vj.

M. f. lotio. To be used with an equal quantity of warm water. (*Dawson.*)

Anti-diabetic syrup.

℞ Antipyrin, gr. cl.
Saccharini, gr. iij.
Sodii bicarbonatis, gr. ij.
Infusi caffeæ, ℥v.

M. f. mist. A tablespoonful twice or thrice daily.

(*Bardet.*)

CHAPTER IV.

THE TREATMENT OF RACHITIS OR RICKETS; OF SCORBUTUS OR SCURVY; AND OF PURPURA.

RICKETS—A Disease of Nutrition—Dependent on Dietetic Defects—Other Causes—Insanitary Surroundings—Symptoms and Characters of the Disease—Frequency of "Nervous" Symptoms—*Indications for Treatment*—Preventive and Remedial—Mainly Dietetic and Hygienic—Cod Liver Oil—Raw Meat Pulp and Juice—Fresh Air and Sea Air—Clothing—Measures to Prevent Deformity—Treatment of Diarrhœa—Tonics—Arsenic—Iron—Phosphorus—Sedatives. SCORBUTUS or SCURVY—A Dietetic Disease—Theories as to Causation—Clinical Features—"Infantile Scurvy"—*Indications for Treatment*—*Prophylactic*—*Curative*—Mainly Dietetic—Salts of Potash—Iron and Quinine—Mouth Washes—Baths and Massage. PURPURA—Often Symptomatic—Purpura Simplex—Purpura Rheumatica and Henoch's Purpura—Purpura Hæmorrhagica—*Indications for Treatment.*

IT will be convenient, in the following chapter, to consider the treatment of the above-named diseases, although their pathological affinities may be somewhat remote.

RACHITIS.

Rachitis or *rickets* is a disease of nutrition, common in infancy, said, indeed, to be the most frequent disease of that period of life. It may originate between the ages of three months and two years.

It is usually traceable to dietetic errors, leading to general malnutrition. It is more common in hand-fed than in breast-fed infants, although, on the other hand, it may be often traced to prolonged lactation and suckling during pregnancy, when the mothers' milk is poor and deteriorated. Chronic diarrhœa, which may itself depend on unsuitable food, not unfrequently precedes this disease. The fault in the diet upon which the occurrence of rickets depends is poorness in animal proteids, fats, and lime salts, and excess in carbohydrates, a fault which prevails in most proprietary foods and in condensed milk, which are so largely given to hand-fed infants. Other contributory causes are a deficiency of fresh air and sunshine; overcrowded, insalubrious houses; and city, as compared with country, life. Hence this disease falls mainly on the poorer classes, but it also attacks the children of the well-to-do, and can then usually be traced to faulty feeding.

Inherited syphilis has been put forward as a cause of rickets, but it has been pointed out that although syphilis may modify rickets it does not originate it. Though the organs generally are affected by the defective nutrition thus induced, the main and more obvious features of this disease are connected with disturbances in the order and regularity of the processes of ossification, and with a marked diminution of calcareous salts in the bones. The epiphysial ends of the bones become enlarged; there is abnormal vascularity and softness; the shafts of the long bones are thicker and bend more easily. These pathological disturbances lead to well-known and characteristic changes in the skeleton. There is deferred closure of the cranial fontanelles and sutures, increased prominence of the frontal and parietal eminences; thus giving rise to a square, broad, prominent forehead, a flat vertex, and often to some asymmetry of the skull from pressure on the softened bones. The jaws become beaked from lateral flattening. The teeth appear late and decay early. This *tardy dentition* is an important feature in the disease, and its occurrence should make us suspect the onset of rickets. Then we have the so-called "rickety rosary," the beading of the ribs at their junction with the cartilages. There are also often lateral and basic grooves from pressure on the thorax, or defective expansion and collapse of the lungs, so that the sternum with the cartilages of the ribs is carried forward and gives rise to one form of pigeon breast. The dorsal spine is convex from forward curvature. The abdomen is tumid and flabby, and some authors describe an enlargement of the liver and spleen in anæmic cases. Pelvic deformities may arise, and may be of serious concern, in female children, in their relation to utero-gestation. The muscles are weak and flabby, and the children, though sometimes fat, are more commonly thin and wasted. Owing to the softness of the shafts of the long bones, and the enlargement of their extremities, they are prone to deformity and to have a clumsy aspect; so that "bow-legs" and "knock-knees" are common.

Amongst other symptoms the child shows a great disinclination to walk, is feeble on its legs, and complains of a "diffuse soreness of body," so that it dislikes to be moved.

Profuse sweating, especially about the head, is common, and some children have a tendency to roll the head about, and so rub off the hair over the occiput. There is often slight fever with nocturnal restlessness, and a tendency to throw off the bed-coverings. The skin has usually a coarse, muddy aspect, and the superficial veins are unduly prominent.

We have already mentioned the frequency with which diarrhœa is found preceding or accompanying rickets. The motions are usually unhealthy in colour and aspect, and very offensive.

Imperfect nutrition of the nervous centres causes mental backwardness, and marked *nervous* symptoms are common, such as *laryngismus stridulus*, *convulsions*, and *tetany*.

Rickets are believed by many to bear a causal relation to certain other diseases commonly observed in childhood, such as broncho-pneumonia, pulmonary collapse, asthma, epilepsy, and chorea.

This brief and imperfect sketch of the general features of this disease will suffice to introduce us to the consideration of its appropriate treatment.

The *indications* for **treatment** are preventive and remedial.

We must endeavour to remove both the parent and the child from the influence of those insanitary conditions and habits of life which we have seen to be influential in causing this disease. We must also apply to the symptoms which attend the developed disease such remedial measures as common-sense and experience have shown to be useful. The treatment of rickets resolves itself mainly into dietetic and hygienic measures. A mother who has previously borne rickety children should, during utero-gestation and lactation, be suitably fed. Care should be taken that an adequate amount of animal proteids, fats, and lime salts enters into her daily dietary. Rapidly repeated pregnancies and suckling during pregnancy should be avoided.

In hand-fed children it is most important also to see that they are not brought up on foods consisting chiefly of carbohydrates, as is so commonly the case with the poor. The milk they get should be good in quality and sufficient in quantity, and should contain its full proportion of cream, or even more than this. In winter a little cod-liver oil, made into an emulsion with lime water and sweetened with milk sugar, is an excellent addition. Each teaspoonful should contain about 10 to 15 minims of the oil, and we must see that it does not disagree with the child's stomach. *Raw meat juice* is a most valuable addition to the diet, as it is rich in salts. A little phosphate of lime may be added to the milk taken. *Raw meat pulp* has also been administered with great advantage in these cases, even up to 2 ounces daily, according to the age of the child. For older children milk puddings are suitable made with "entire wheat flour."

If the child has been suckled by a delicate and exhausted mother, it should be at once weaned and a diet prescribed such as we have just indicated. We repeat that farinaceous foods are quite inadequate *alone* for the nutrition of such children ; they are not only poor in lime salts, but they are prone to undergo lactic acid fermentation, which is calculated to aggravate the disease.

In older children sandwiches of raw meat pulp, meat juices and broths, eggs beaten up with milk or lightly boiled, and the juice of fresh fruits may be added to the diet from time to time. We must not *overdo* the giving of fat, nor make too sudden changes in the child's diet, as digestive disturbances are easily set up.

Fresh air and plenty of sunshine in a healthy country district or at the seaside, and removal from close, dark, overcrowded city dwellings, is of the greatest importance. Good ventilation of sleeping and dwelling apartments should be seen to. The air of the sea-side will be found of special value in many cases.

Bathing and sponging with tepid water night and morning is useful; the child should be dried quickly, and careful friction with the hand applied. A little olive oil or cod's liver oil may be rubbed in at the same time.

Children who suffer from this disease are very sensitive to chill and apt to fall victims to broncho-pneumonia, pulmonary collapse, etc., and they must there fore be warmly clad in well-fitting woollen clothing, and a flannel band should be worn round the abdomen. But the garments must fit easily, so as not to hamper the respiratory movements or those of the limbs.

We should endeavour to prevent or correct deformities by improving the nutrition and tone of the muscles, in which gentle massage and frictions will be of much service. The limbs can be thus drawn into their natural positions and deformity guarded against. We must protect the pliable bones from the weight of the body, from muscular action and external forces. In some cases it is necessary to apply splints which project beyond the feet, so as to entirely prevent locomotion. Surgical measures may be needed in certain cases to correct permanent deformities.

There is but little scope for drug treatment in this disease. When there is diarrhœa, such as we have already referred to, it is of the utmost importance that it should be checked, as it seriously affects the nutrition of the child. A combination of carbonate of lime and salicylate of bismuth (as an intestinal antiseptic) in doses suitable to the age of the child will be the best remedy, together with an occasional dose of grey powder.

Some preparations of iron, such as the syrup of the iodide or the citrate of iron and ammonia, will be needed in markedly anæmic cases. Arsenic also is employed with advantage for the same purpose. A combination of syrup of iodide of iron with small doses of cod's liver oil is a good prescription. Jacobi and others have recommended phosphorus, $\frac{1}{120}$ grain, dissolved in olive oil twice or thrice daily.

For the nervous complications sedatives may sometimes be needed, such as 2 or 3 grains of sodium bromide with a grain of chloral.

SCURVY OR SCORBUTUS.

Scurvy or *scorbutus* arises, like rickets, from a defective and unsuitable dietary. It has been defined as a constitutional disease characterised by anæmia, great loss of strength, a spongy condition of the gums, and a tendency to hæmorrhages.

"Infantile scurvy," like rickets, has been traced to deprivation of *fresh* milk and to a preponderance of carbo-hydrates in the artificial foods and condensed milk so largely used. This disease was at one time very prevalent amongst sailors and armies in the field, and was attributed to the difficulty in providing them with fresh animal and vegetable food. Since prophylactic measures have been adopted it has been practically abolished in the naval service.

Dr. W. B. Ransom * warmly challenges the statement that *boiled* milk is a cause of scurvy in infants. He examines and criticises very fully the evidence for and against this belief, and arrives at the conclusion that "there is no solid evidence to show that milk raised to its boiling point . . . for ten minutes or a quarter of an hour suffers any diminution of its nutrient qualities. Neither is it probable that, if consumed within 24 hours of the heating, it will cause infantile scurvy."

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* *British Medical Journal*, Feb. 22nd, 1902.

Some modification must be made in the view which was promulgated by Garrod and generally adopted that scurvy was due entirely to the absence of fresh *vegetables* in the food, and the consequent deprivation of the blood of salts of potassium. Another view was that it was caused by the absence of the *organic* salts (not the potash) which are found in fruits and vegetables, so that the *alkalinity* of the blood was thereby diminished.

But it has recently been maintained that it is due to some *toxic* substance in the food—the ingestion of *ptomaines* in salted or improperly preserved meat—and that it is rather to the absence of *fresh meat* than of fresh vegetables that scurvy is due. This view is supported by the fact that in the Nansen expedition the men were protected from scurvy by a diet of *freshly* killed *meat*, without any *lime* juice (the usual prophylactic); while it is stated that in other expeditions scurvy has arisen, in spite of lime juice, when the men have been compelled to live on tinned and preserved meats.*

Yet another view has been put forward, but not resting on the same experimental evidence as the preceding, that this disease is dependent on a specific micro-organism, and that it is *infective*. Its epidemic occurrence in armies and ships and in certain parts of Russia, where it is very prevalent and regarded as infective, although seeming to lend support to this view, may be accounted for in other ways, and no definite pathogenetic organism has been isolated. It has, moreover, been wisely said that "even though the disease should prove to be infectious, it would remain certain that unsanitary surroundings and improper diet are factors of the greatest importance in preparing a suitable soil for the occurrence of scurvy." *

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* *Lancet*, April 28th, 1900.

No doubt other factors, moral and physical, besides improper food, contribute to the production of this disease, such as overcrowding, confinement in cold, damp quarters, prolonged fatigue under depressing influences, and mental depression ; this last factor will account for its tendency to occur amongst prisoners.

The clinical features of scurvy are dependent on the altered condition of the blood which leads to hæmorrhages in various parts of the body—especially subcutaneous and inter-muscular—and to the grave anæmia attending these changes.

The earliest symptoms are progressive debility, lack of energy, mental and physical, and notable pallor. The complexion becomes sallow and unhealthy, and there is complaint usually of pain in the back and limbs. Then there is *stomatitis*, with spongy, swollen gums, which bleed readily. The tongue is coated and swollen. The teeth become loose and may actually fall out; even the jaw may, in some instances, become necrosed. The breath is very fetid. Hæmorrhage beneath the buccal mucous membrane is often seen.

The skin is dry and rough and a purpuric rash (ecchymoses) appears first on the lower limbs and then on the arms and trunk, the petechiæ being confined mostly to the region of the hair follicles; when there is subcutaneous hæmorrhage we may find irregular, swollen, purplish patches in various parts of the body, but especially over the thighs and buttocks. Nodes may appear on the legs from effusions between the bones and the periosteum. Hæmorrhage between the muscles and beneath the fasciæ may lead to brawny swellings in the calves. The slightest bruise or injury will cause ecchymosis. Epistaxis is frequent, and in severe cases hæmaturia and bleeding from the bowel may occur. Constipation is a common symptom. A subacute arthritis is not infrequent, with much tenderness over the joints and sometimes effusion into them, especially the knees and ankles.

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* Dr. Banks, Hare's "System of Practical Therapeutics" (second edition), vol. i., p. 829.

Accompanying these manifestations there are the symptoms of profound anæmia, great feebleness, cardiac palpitations and dyspnœa, and the usual microscopic changes in the blood. Grave complications often arise. Night blindness is simply due to retinal exhaustion from anæmia and malnutrition. Cerebral and meningeal hæmorrhage may cause paralysis, convulsions, and coma. Infective pneumonia and pulmonary gangrene may arise from the inhalation of septic matters from the mouth. Hæmorrhagic pleurisy and pericarditis occasionally occur. Diarrhœa and dysentery are occasional complications. But it is exceptional nowadays to encounter these grave complications, as suitable treatment early applied usually leads to complete recovery.

The symptoms of "*infantile scurvy*," at one time termed "acute rickets," have been fully analysed and described by Barlow,* and it is not necessary to repeat them here; suffice it to say that they are of the same nature as those we have just reviewed, and depend on the same tendency to hæmorrhages in various parts. The disease also originates in dietetic errors, and is remedied mainly by dietetic measures.

The indications for **treatment** are to restore the blood to a healthy normal state by appropriate food and to relieve the symptoms that arise in the course of the disease, as the stomatitis, anæmia, etc.

There is also the prophylactic indication, viz. to take suitable measures to prevent the onset of the disease in those exposed to it by their calling. Sailors who are bound for long voyages, soldiers on active service, and prisoners are those more especially liable to suffer from scurvy from the lack of fresh animal and vegetable foods. In the case of sailors, in most instances the outbreak of the disease can be prevented by the issue of a daily ration of such anti-scorbutic substances as lemon or lime-juice, sugar, and vinegar.

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* Bradshaw Lecture on "Infantile Scurvy," 1895.

The law in the United States applying to seamen requires that after salt provisions, mainly, have been served out to the crew for 10 days and as long afterwards as such consumption of salt provisions continues, half an ounce of lime or lemon juice and half an ounce of sugar shall be served out to each member of the crew daily, and half a pint of vinegar per week. Whenever in port, great care should be taken to secure rations of fresh meat, with fresh vegetables and fruit. Dried and canned fruit and vegetables as well as pickles are good substitutes for the fresh articles, and are especially useful to vary the monotony of the food. It has been stated, on the testimony of many explorers, that *raw* meat has proved a preventive of scurvy when *cooked* meat has not.

Curative measures also are mainly dietetic. It must be remembered that when the patient first comes under treatment, his digestion may be very feeble, and the state of the mouth and gums will quite disable him from taking solid food. Vegetable soups and purées, the pulp of fruits, the juice of lemons or limes, and scraped raw meat, should be given at first and in small quantities at a time, until some restoration of digestive power is obtained. Spinach and other green vegetables, red-cabbage, pickles, lettuce, watercress, sorrel, are useful, and these may be mixed advantageously with mashed potatoes or pea or lentil meal. But fresh meat and fresh milk and eggs are also anti-scorbutic, and when procurable should be added to the preceding foods; and indeed, in some cases, either from the distaste of the patient or for other reasons, they may have to take their place. A due amount of fresh animal food is needed to overcome the extreme anæmia often met with in these cases; raw meat juice and scraped raw meat are excellent for such patients. Small quantities of scraped meat may be mixed with milk and given frequently when the stomach is much disordered, together with full doses of lime-juice.

In *infantile* cases a judicious mixture or alternation of potato-pulp, fresh milk, and raw meat juice will generally be found useful and acceptable to the child. A fine potato gruel may be made in the following manner :—Rub some steamed floury potatoes through a fine sieve, beat them up well with milk till smooth and of the consistency of thin cream. A teaspoonful of this may be added to each bottle of food at first, and gradually increased to a dessert-spoonful. Well boiled carrots may be treated in the same way; or freshly made beef tea or chicken broth may be used instead of milk. It is important to remember that peptonising milk seems to impair its anti-scorbutic property. The child should, at the same time, be given a teaspoonful of grape or orange juice occasionally. The organic salts of potash—the tartrate or the citrate—are prescribed by some, and with these may be combined a few grains of the ammonio-citrate of iron, or the citrate of iron and quinine.

Antiseptic and astringent mouth washes will be needed for the spongy and bleeding gums. Tincture of krameria and alum make a useful astringent mouth wash, half an ounce of the former and a dram of the latter to 8 ounces of water. Another good mouth wash may be made with potassium chlorate, 1 dram, and tincture of myrrh, 2 drams, to half a pint of water. These may be warmed and used frequently, and especially after taking food. Dilute carbolic lotion and Condy's fluid have also been used as antiseptic mouth washes. In some cases it has been found necessary to paint the gums with a strong solution of nitrate of silver. For constipation either large enemata should be used or such gentle saline aperients as sodium sulphate or phosphate. If diarrhœa should exist it may be controlled by a mixture of bismuth with chalk and tincture of catechu. The continued use of such tonics as quinine and iron and strychnine will be needed during convalescence.

In cases of profound anæmia, the subcutaneous injection of normal saline solution has been found beneficial. Warm baths, together with gentle massage and passive movements, will help to restore the stiffened joints to their normal mobility. Gentle friction over the ecchymoses of the legs and also over the deeper situated hæmatomata may promote their absorption.

PURPURA.

Purpura, in many of the conditions in which it appears, is rather a symptom than a disease. It is found accompanying many different pathological states, and is characterised by an extravasation of blood into the skin and, in some of the more serious forms, into other organs. It appears sometimes as small spots termed *petechiæ*, and at other times in larger patches termed *ecchymoses*. The former often coalesce to form the latter. The escape of blood is mostly due to rupture of capillaries from malnutrition of their walls, aided, in some cases, by heightened vascular tension. But sometimes, no doubt, the blood passes through the walls of the capillaries by diapedesis. It is doubtful whether the extravasation is due to the state of the blood or the state of the vessels, but in such instances as senile purpura it is probably due to vascular degeneration. It is sometimes caused by capillary emboli, as in the instances that occur in connection with chronic valvular cardiac disease. In many cases there can be no doubt that blood changes exist, and it has been generally found that the coagulation time is retarded. In its symptomatic forms it is found (*a*) in association with *infective* diseases, as in septicæmia, typhus fever, measles, smallpox, etc.; (*b*) in association with certain poisons and certain drugs, as snake poison, quinine, potassium iodide, etc. etc.; (*c*) in cachectic and neurotic conditions, as in cancer, Bright's disease, scurvy, in tabes, myelitis, hysteria, etc. etc.

But we need not dwell here on these symptomatic forms; our concern is mainly with those forms of doubtful pathology which we know as *purpura simplex*, *purpura rheumatica* (and *Henoch's purpura*), and *purpura hæmorrhagica*, or " malignant " purpura.

In *purpura simplex* the symptoms are not usually severe; there may be loss of appetite, perhaps a little sore throat, pains in the joints, and debility. Accompanying these symptoms is the appearance of an eruption in the skin of scattered bright red or purplish spots, chiefly on the legs and ankles and less abundantly on the trunk. They are not raised, and do not fade on pressure. They often run together to form large irregular patches. After a few days they fade and leave a light brown stain. It usually occurs in children and in youths, and is often associated with anæmia, and occasionally with diarrhœa.

Purpura rheumatica, sometimes termed *peliosis* R., is a more severe affection. There is usually slight pyrexia, the joints are swollen and painful, and the eruption occurs mainly around the joints of the legs, and may be combined with *erythema nodosum*. Relapses are common, and it leaves a marked tendency to anæmia and dyspeptic troubles.

Henoch's purpura resembles the preceding, but is a more serious disease; it is chiefly seen in children, and is characterised by attacks of gastralgia and colic, with vomiting and diarrhœa. There is also a tendency to hæmorrhage from the mucous membrane and from the kidneys.

Purpura hæmorrhagica is the term applied to the most severe form of this disease, in which there is generally considerable hæmorrhage from the mucous membranes. It is most commonly met with in young and delicate girls. Ushered in with symptoms of general weakness and debility, in a few days purpuric spots appear in the skin and increase rapidly in number and size. Epistaxis, hæmaturia, and hæmoptysis may follow, giving rise to profound anæmia. Sometimes a rapidly fatal issue is brought about by the severe loss of blood, or by cerebral hæmorrhage.

There is usually some slight pyrexia. In cases that recover, the disease usually ends in from 10 to 14 days.

It is not easy to formulate *definite indications* for **treatment** in this disease, owing to the obscurity that hangs over the pathology of many of its forms. The symptomatic forms can only be properly treated in association with the appropriate treatment of the morbid states they accompany. In those cases, for example, which arise from capillary emboli in chronic valvular cardiac disease, it is clear that no treatment can be profitably directed to the purpura. The occurrence of purpura as a symptom points to the need of vigorous tonic and supporting measures—measures directed against the anæmia which is certain either to accompany or follow it. Whenever it is practicable, a full diet of nourishing food should be ordered in agreement with the digestive capacities, as well as abundance of fresh air. Arsenic in full doses has been found useful in the milder forms. In the rheumatic cases, sodium salicylate has been given, but we prefer salicine as quite as useful and far less depressing. Oil of turpentine in 10-minim doses three or four times a day has been thought to check the hæmorrhage. Other drugs that have been given for the same purpose are ergot, tannic and gallic acids, acetate of lead, aromatic sulphuric acid, etc.

Professor Wright has suggested the use of calcium chloride in 20-grain doses four times a day, for three or four days, to increase the coagulability of the blood. When there is bleeding from the mucous membrane of the mouth or nose, it may be desirable to try the local effect of a solution of *adrenalin chloride*, which appears to have a remarkable effect in causing contractions of the arterioles.*

In the rheumatic cases, prolonged confinement to bed should be insisted upon to guard against relapses. In convalescence, blood restoratives will be needed, as the various preparations of iron—the perchloride is one of the best—with quinine and strychnine.

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* Parke, Davis & Co. provide a solution of 1 in 1,000, ready for use.

ADDITIONAL FORMULÆ.

For Rickets.

℞ Ferri carbonatis saccharati
Ferri lactatis
Calcii phosphatis
Sacchari lactis } āā ʒjss.
M. f. pulv. Ten to twenty grains daily. (*Billroth.*)

For the same.

℞ Phosphori, gr. ⅛.
Solve in
Olei amygdalæ dulcis, ʒiij.
et adde
Pulv. g. acaciæ, ʒj.
Syrupi simplicis, ʒiss.
Aquæ destillatæ, ℥ijss.
M. f. mistura. One to four teaspoonfuls daily.
(*Billroth.*)

For the same.

℞ Olei morrhuæ, ʒss.
Syrupi calcis lactophosphatis
Liquoris calcis } āā ♏xv.
M. f. dosis. To be taken three times a day—for a child one year old.
(*J. Lewis Smith.*)

For the diarrhœa of rickets.

℞ Olei ricini, ♏v.
Mucilaginis tragacanthæ, ♏xv.
Syrupi ʒss.
Aquæ menthæ piperitæ ad ʒj.
M. f. dosis. To be taken three times a day—for a child one year old. (*Angel Money.*)

For infantile scurvy.

℞ Liquoris arsenicalis, ♏j.
Vini ferri, ʒss.
M. f. dosis. To be taken three times a day with or without 10 to 20 minims of cod's liver oil—for a child one year old. (*Muskett.*)

Mouth-wash for spongy and bleeding gums.

℞ Glycerini acidi carbolici
Glycerini acidi tannici } āā ♏xv.
Aquæ ad ℥j.
M. f. lotio. (*Cheadle.*)

Purgative draught for purpura.

℞ Spiritus terebinthinæ, ʒij.
Olei ricini, ʒij.
Syrupi limonis, ʒss.
Mucilaginis tragacanthæ, ʒiij.
Aquæ menthæ piperitæ ad ℥j.
M. f. haust. To be taken every or every other morning according to the effect produced—for a child six years old. (*Eustace Smith.*)

Thymus gland in rickets.

Founded on the statement that the thymus gland is functionally associated with the proper development and growth of bone. *Mendel* suggests that the symptoms of rickets may be due to a disturbance of the functions of that gland. He has, in consequence, treated over 100 cases with thymus, using, latterly, tabloids of gland substances. He states that all the symptoms gradually diminished and eventually disappeared. The treatment had usually to be continued for some months.

(*Brit. Med. Journal* Epitome, March 8th, 1902.)

Part IX.

SPECIFIC INFECTIVE DISEASES.

CHAPTER I.

THE TREATMENT OF ACUTE RHEUMATISM.*

Nature and Characters of the Disease—An Acute Infective Disease with local Manifestations—Symptoms—Etiology—Pathology—Rheumatic Hyperpyrexia—Subacute Cases—*Indications for Treatment*—Rest—Diet—Alkaline Drinks, with Milk—Local Applications—Blisters, etc.—*Salicylates and Salicin*—Toxic Symptoms from Salicylates—Importance of Purity of Drug—Choice of Preparations—Doses—Salophen—Aspirin—*Methyl Salicylate*—Sodium Benzoate—Opium—*Alkalies*—A Combination of Alkalies and Salicylates—Free Consumption of Pure Water—Quinine—Potassium Iodide in Subacute Cases—Treatment of Hyperpyrexia—Cold Baths—Treatment of Convalescence. Additional Formulæ.

Acute rheumatism is a disease of very frequent occurrence in England: it is characterised by fever and by the occurrence of inflammation in certain of the synovial membranes, with a tendency to attack the endocardium particularly, and less frequently one or other of the serous membranes.

The synovial membranes of the joints of the *extremities* are those usually attacked, and the pericardium (next to the endocardium) is the most frequently affected of the serous membranes. The pleura is, however, more frequently affected than is generally recognised, and in rare instances the peritoneum does not escape. It is interesting to note this specialisation of the inflammation to parts of related, if not identical, structure and functions. The serous membranes and the endocardium not only resemble the synovial membranes in structure, but they also subserve an analogous purpose, that of facilitating the functional movements of internal organs.

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* In the former edition of this work acute rheumatism was treated of in Part VIII. as one of the "constitutional diseases;" in agreement with more recent views of its pathology it has been transferred to this Part.

In the great majority of cases, the joint affection does not involve any anatomical changes, beyond inflammatory hyperæmia of the synovial membrane, and effusion of fluid into the joint, and this is consistent with the manner in which the inflammation will quickly subside in one set of joints and attack others. The joints, though swollen and very painful, are not very red ; and the patient's sufferings depend greatly on the number of the joints involved. In *subacute* cases the joint affection may be slight, and the pains also; and in a few rare instances, especially in children, there may be endocarditis and myocarditis without any notable joint inflammation.

The knees are the joints most frequently affected, the shoulders and ankles next, then the wrists and hands and the elbows. It rarely attacks the hips, and still more rarely the toes, and in the other joints of the body it is scarcely known. Acute rheumatism is also peculiar, as has already been remarked, in its tendency to move rapidly from one set of joints to another.

A remarkable observation of Graves, bearing on the pathological nature of this disease, was that the fever may occur alone, without any joint affection ; and another important fact is that the pericardium or the endocardium, or one or other pleura, may, for a time, be the only membrane affected. Dr. Lees maintains that the heart is almost always, in children, seriously involved, while the arthritis may be insignificant.*

In acute cases of average severity the temperature usually ranges between 102° and 104° F. early in the disease, from the second to the fourth day. In *subacute* cases it may be between 100° and 102°. The pulse is rapid, the tongue coated with a thick white fur, the skin often bathed with sour-smelling perspiration; and connected with this great loss of water from the surface there is great thirst (with loss of appetite), and the *urine* is scanty, high-coloured, dense, and deposits an abundance of lithates. The chlorides have been found much diminished, and even absent (*Osler*).

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* Allchin's "Manual of Medicine," vol. i., p. 299.

The tendency to the development of endocarditis, myocarditis, and pericarditis in the course of this disease is an important point to bear in mind; and we should also remember that these complications are more liable to occur the younger the patient is. The pleura also is often involved, though this is frequently overlooked.*

Lees † maintains that the cardiac inflammation and dilatation is a *normal* character of the disease, as seen in children, and should not be regarded as a *complication.* No doubt, at this early age, injury to the heart is more common and more serious than in adults, while the joint affection is of minor importance.

Sudanina and erythematous and other skin eruptions are common. Subcutaneous, so-called "rheumatic *nodules*" are often seen in children. Lees thinks they point to an intensity of the rheumatic process. Tonsillitis is a frequent initial symptom, and it is thought that the infective agent often gains entrance to the blood through the tonsils.

With regard to the *causation* of acute rheumatism, it is apt to be set down, without sufficiently careful inquiry, to exposure to cold and wet, and this may be the case in a certain number of instances, but in very many patients no such exposure can be discovered. American writers consider the season of spring favourable to the occurrence of acute rheumatism, but this does not appear to be the case in Great Britain. Over-exertion and muscular fatigue as well as, or combined with, exposure to chill are also regarded as causes; but it is probable that these depressing conditions simply produce a loss of the normal power of resistance to the exciting cause of this, as of other, acute infective diseases. An *inherited* constitutional proneness to this disease no doubt often exists, just as it does in tuberculosis. Childhood and youth are predisposing causes. The greatest number of cases appear to occur between the ages of ten and twenty.

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* Lebert found pleurisy in 10 per cent. of his cases.

† Allchin's "Manual of Medicine," vol. i., p. 301.

As to the *true* nature of acute rheumatism, the *lactic acid* theory, which referred this disease to the accumulation of that substance in the blood, has now few adherents; the *nervous* theory, which attributed it to trophic nerve disturbances resulting from chill, is no longer seriously advanced; while the latest view, that it is a microbic infection, is almost universally accepted.

In support of the last hypothesis the analogy is urged between the phenomena of acute rheumatism and those of pyæmia, septicæmia, scarlet fever, and other infective diseases; the arthritis, the fever, the sweatings, the tendency to cutaneous eruptions, the rapidly developed anæmia, the leucocytosis, the tendency to the involvement of the endocardium and the serous membranes, the relapses, all combine to present "the very type of an acute infection." Although the presence of a definite specific micro-organism cannot be said to be as yet established, a bacillus has been found in the blood during life, and a diplococcus has been demonstrated in rheumatic *nodules*. This subject is still under investigation.

We may therefore conclude that acute rheumatism should be regarded as an infective fever, having as its most important feature a toxic action on the heart, especially virulent in children, with those other clinical manifestations already mentioned.

The great liability to **relapses** must be borne in mind in the management of these cases.

Apart from the consequences of the cardiac lesions it may induce, and the occasional, but rare, occurrence of rheumatic hyperpyrexia, this disease in adults is scarcely ever fatal.

A few words must be said relative to the occurrence of **hyperpyrexia** before we pass on to the main part of our business, viz. the discussion of the treatment of this malady.

Occasionally, in apparently favourable cases, hyperpyrexia may suddenly supervene, the temperature rising as high as 109° to 110°, or even higher, and with this rise of temperature certain *cerebral* symptoms usually appear, convulsions, or violent delirium, or drowsiness, and, finally, coma. French authors term these cases, cases of *cerebral rheumatism*, but hyperpyrexia may occur, and the temperature rise to 108°, or even to 110°, without cerebral symptoms. The pulse is fast and feeble, and there is extreme prostration. Warning symptoms of the approach of this complication are a cessation of the sweatings, a disappearance of the pains, and a restoration of the mobility of the joints.

The **subacute** cases are often excessively tedious, and of very slow progress, and much less amenable to treatment than the acute forms. A sub-febrile temperature, about 99° or 100°, will continue with but slight fluctuations, and with an occasional rise to 101° or 102°, for many weeks. These are, perhaps, amongst the most tedious cases we see in the hospital wards.

Acute rheumatism, when left to follow a *natural* course, untreated, is apt to be prolonged and tedious; and we may claim to have made some advance in its treatment since the days of that physician, quoted by Sir T. Watson, who, when asked what was good for acute rheumatism, answered, "Six weeks!"

In the absence of any definite *causal indication*, we may formulate the following general and symptomatic **indications** for the **treatment** of this affection.

(1) To lessen the local articular inflammation and severe pain by rest and pain-relieving remedies.

(2) To modify and change, if possible, the morbid state of the blood and other fluids.

(3) To protect the heart, so far as we possibly can, from serious and permanent injury.

(4) To take suitable measures to immediately reduce *hyperpyrexia* should it arise.

(5) To guard against the tendency to relapses by careful and prolonged supervision during convalescence.

The first indication will be promoted by ordering the patient absolute rest in bed from the earliest appearance of the symptoms. There will be no difficulty in enforcing this in the severe or average case; but in subacute cases, without much joint inflammation or pain, it may not be so easy; and then we may have to point out to the patient the serious risk he runs of bringing on cardiac complications by the neglect of this indication.

As the patient will have to remain in bed probably for many weeks, and for some days, at least, will suffer from profuse perspiration, it is most important, for his comfort, that the bed should be well arranged. A feather-bed is obviously unsuitable; a soft hair-bed, on a good spring mattress, is the best. It is not necessary that he should lie *between* blankets, as is often suggested, as this proves very heating and uncomfortable to many; but he should *lie on* a soft, thin blanket, and be covered by a cotton sheet. This will be all that is necessary in order to prevent unpleasantness from the profuse perspiration. He should have a loosely-fitting night-dress of soft, thin flannel, with frequent changes, as this dress becomes quickly saturated with the sour-smelling perspiration; and it is a good plan, in order to facilitate examination and dressings, for the night-dress to open down the whole length in front, and very freely on the outside of the sleeves; a light flannel cape may be worn over the shoulders. When the joints of the lower limbs are very painful and swollen, the weight of the bed-clothes may be kept off by a low cradle. The patient must not be allowed, even if he wishes, to get out of bed to evacuate either bowels or bladder.

The **diet**, while the fever and joint inflammation are present, should be of the lightest possible kind, cooling, and entirely fluid. A jug containing a pint of milk diluted with a pint of boiled water, and containing 30 or 40 grains of sodium bicarbonate, and 10 to 20 grains of common salt, and cooled by a lump of ice, should be kept near the patient, and a tumblerful given him frequently. He may take in this way 3 to 4 pints of milk * in the twenty-four hours. Another jug should contain a decoction of lemons, made by roughly tearing a lemon to pieces and boiling it for ten minutes in a pint of water, and straining and then adding 20 to 30 grains of bicarbonate of potash, and some ice to cool it. This may be freely drunk in the intervals between the milk. The free consumption of these pleasant alkaline and cooling drinks answers the important indication of altering and improving the blood condition by diluting noxious substances in it, promoting their elimination, and supplying the great loss of water that is taking place by the skin, as well as of maintaining the due alkalinity of the fluids. Whey may be taken instead of milk if the latter should by chance disagree, which it is most unlikely to do, if given in the manner we have suggested. If the patient drinks three jugs of the milk and water prepared as directed, and three jugs of the lemon drink in twenty-four hours, he will have taken at least 90 grains of sodium bicarbonate and 60 grains of potassium bicarbonate (much of the latter converted into citrate) dissolved in a large quantity of water—about 150 ounces. It will also be seen later on that we propose that some of this fluid should be the vehicle for the administration of his medicines. This quantity of fluid is not excessive, considering the loss by the skin in the acute stage. As soon as the urine becomes pale and gives an alkaline reaction, the amount of alkali in these drinks must be diminished. Thin oatmeal gruel and barley water also are permissible, but all meat extracts are particularly counter-indicated in the febrile stage and when the urine is dense and high-coloured. A cup of weak tea may be taken now and then if desired. After the febrile stage, light clear soups and broths may be given, flavoured with vegetables and savoury herbs. A little pounded beef or chicken and some crumb of stale bread may be mixed with the soups; light farinaceous puddings, bread and milk, and such foods are also suitable. All alcoholic beverages are to be avoided, save in quite exceptional cases. In unduly protracted cases some forms of light animal nourishment may have to be given, although the temperature may still be febrile. We prefer pounded meat added to light broth rather than strong beef extracts. Some supporting food of this kind should be introduced into the diet as early as possible to counteract the tendency to anæmia.

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* Biot, of Lyons, has found a milk diet of itself an excellent remedy in acute rheumatism, relieving the pain and lowering the temperature. He considers it acts by stimulating the renal functions. The combination we have advised above will frequently be found to exert a remarkable diuretic effect.

Besides absolute rest for the inflamed joints (which may sometimes be promoted by the adaptation to the limb of suitable splints) some form of *local* treatment for the purpose of relieving pain and reducing inflammation is usual, and often beneficial.

The application of **blisters** to the joints has, from time to time, received warm approval, although at present it is but rarely adopted, probably because our general remedies prove so much more efficacious in relieving the joint affections than used to be the case. Blisters may be applied either after the manner recommended by the late Dr. Herbert Davies, who applied the blisters *directly* to the inflamed joints, as for instance, 3 inches of cantharides plaster *around* the knee, a plan adopted also by Fraentzel in Berlin; or according to the plan of Lasègue, of Paris, which we think preferable—namely, to apply a strip of blistering plaster 1½ to 2 inches wide, an inch or two above and below the inflamed joint. We still adopt this method, and often with great advantage, in the somewhat protracted cases in which the joint affection does not readily yield to treatment with salicylates. Most authorities admit that blistering the joints is attended with relief of pain and diminution of inflammation, but many contend that with our modern methods of treatment it is rarely needed, and that it has the decided disadvantage of tending to cause renal and vesical irritation. It has never been our lot to see either renal or vesical irritation produced by blisters, and we believe it rarely, if ever, occurs, except from their improper use and unskilful application. A practitioner who is unwise and incautious enough to blister a great number of joints *at once*, or to use very large blisters, or to leave the blisters in contact with the joints for many hours longer than necessary for the purpose of counter-irritation, may certainly run the risk of causing some irritation or inflammation of the kidneys or bladder; but if one or two joints only are blistered at a time, if only *small* strips of blistering plaster are used, if they are not kept on more than three to five hours, according to the sensitiveness of the skin, and if the blister is properly and skilfully dressed, there will be little or no danger of this untoward result.

Osler recommends the light application of Paquelin's cautery as superior in its effects to blistering.

When there is much pain in the joints, perhaps the best application is a lotion composed of one part of laudanum to six parts of hot water, with about 20 grains of sodium bicarbonate to the ounce; strips of lint or of soft linen are dipped in this lotion and applied to the joint, which is then enveloped in absorbent cotton-wool retained by a light flannel bandage. Ichthyol ointment has been recommended to be rubbed into the joints, and may be applied with benefit in the more protracted sub-acute cases.* The local application of oil of wintergreen (methyl salicylate), to which we shall again refer, has proved useful in the same class of cases. Simply enveloping the joints in cotton-wool will suffice in most instances.

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* Other local applications will be found amongst the formulæ at the end of this chapter.

We now pass on to the consideration of the **general** internal medicinal **treatment** of acute rheumatism.

We will first consider the treatment by **salicylates** and **salicin**, a method which has certainly proved more efficacious than any other that has ever been advocated in the treatment of this disease. The first to use salicylic acid in acute rheumatism was Buss, of Basle, in 1875; then Stricker in Traube's clinic employed it, and published some of his results in January, 1876; and in the same year Maclagan published some cases he had treated with salicin. In 1877 Germain Sée advocated the use of sodium salicylate, and this salt rapidly displaced salicylic acid and salicin. Since then the salicylates have gradually and steadily gained in favour, and may now be said to be almost universally adopted.

One of the first and most notable effects of the salicylate treatment is the subsidence of articular pain and swelling. Usually in twenty-four hours considerable relief is experienced, and both pain and swelling will often completely disappear within three to five days. At the same time there is generally a steady and rapid fall of temperature, and the patient may be quite free from fever in from three to six days.

With regard to the influence of this treatment on cardiac complications. Since in very many instances of treatment by salicylates the acute phase is practically over in less than three days, most physicians fully recognise the *indirect* influence of the salicylates in protecting the heart from injury, as it diminishes greatly the total duration of the acute and active period of the disease; and even when a cardiac complication has already been excited, the salicylates, by lowering cardiac action and reducing vascular tension, which they do in a remarkable manner, and by relieving pyrexia, tend to prevent the advance and to diminish the intensity of the endocarditis, and so lessen the gravity of the lesion.

We have not found that relapses are more frequent, as has been stated, after the salicylates than after other methods of treatment, especially if the treatment is maintained, as it should be, in a modified form, for at least a fortnight after the cessation of the primary acute attack.

There are some cases in which we find an intolerance of salicylates, just as in other persons we find an intolerance of quinine, and then certain disagreeable characteristic symptoms become developed. Nausea, epigastric pain, and vomiting are sometimes produced; great cardiac depression with slowness of pulse has often been observed after long-continued full doses; giddiness, dimness of vision, deafness, and buzzing in the ears and headache are sometimes complained of, and even delirium has been observed in some instances. An erythematous eruption on the skin has occasionally been noted, and also epistaxis and hæmaturia. The question has arisen whether these toxic symptoms are not sometimes due to **impurities** in the salicylic acid, and it has been maintained that they are far more liable to occur with the artificial than the natural acid. Professor Charteris isolated a substance from the artificial acid and its soda compound, which he was able to prove to be the cause of the toxic symptoms observed in many cases, and he suggested a method for their purification. Great care should always be used in seeing that a pure preparation is dispensed. Either the "*natural*" or the "physiologically pure" salt should always be prescribed.

Women seem more susceptible to these toxic effects than men, while children bear salicylates remarkably well. Dujardin-Beaumetz pointed out that it was important to ascertain if these preparations were freely eliminated by the kidneys, for if this is not the case, owing to the existence of chronic renal disease, dangerous symptoms may arise.

Next, with regard to the best manner of administering the salicyl compounds and the doses necessary.

We may make use of either salicylic acid, or sodium salicylate, or salicin. The acid is the least desirable form, as it is very slightly soluble in cold water, and it is never desirable to give medicines in the form of insoluble powders when we can substitute a soluble salt of equal efficacy. It may, however, be dissolved by mixing it with a solution of acetate of ammonia or citrate of potash; about 40 grains of citrate of potash will dissolve 20 grains of salicylic acid in an ounce of water; but in this case decomposition takes place and potassium salicylate is formed. There is no objection whatever to this, especially if we desire to give some potassium salt with the salicylate. Salicylic acid may then be given dissolved in this manner, or sodium salicylate may be used instead, as is generally done. The dose of either is from 5 to 30 grains, according to the age of the patient and the severity of the attack, given at first every two hours. In an adult, if the attack is not a severe one, we may begin with 10-grain doses; if the attack is severe and the temperature high, it will be advisable to begin with doses of 15 or 20 grains or even more. If on the second day the pain and fever show no very distinct signs of abatement, we must increase the quantity given, and as much as 3 or 4 drams may be given in twenty-four hours; this may be given either every two (15 to 20 grains) or three hours (20 to 30 grains).

If such doses produce no beneficial effect, it is advisable to discontinue the drug as inapplicable to the particular case under treatment. We must be prepared, from time to time, with this as with nearly every other drug, to find particular instances of insusceptibility to its action. When, however, this remedy has its usual and characteristic effect, when it relieves the pain and brings down the temperature, we should not continue the large doses, but reduce them gradually until the patient is taking about 45 or 60 grains daily, and in such doses the remedy should be continued for a fortnight after the acute symptoms have subsided. The sodium salt should be given freely diluted with water, and as milk disguises its unpleasant taste, it may be given mixed with a wine-glassful of the milk and water beverage we have already recommended. This will be found to simplify the nursing, as the medicine will thus be given together with a portion of the milk food.

Maclagan prefers *salicin* to the salicylates, and he gives it in large doses. The testimony of most other observers is that this drug has not so great an influence in reducing temperature or relieving pain as the salicylates, but it is certainly less depressing, and there is less risk with it of exciting toxic symptoms. We often give it in preference to the sodium salicylate, especially in mild cases, and in feeble, sensitive persons. It may be given, at first, in doses of 20 to 40 grains every two or three hours, and then, after it has subdued the acute symptoms, in smaller doses and less frequently. It is only sparingly soluble in cold water, and it is best, therefore, prescribed in powders combined with half as much potassium citrate and a few grains of sugar of milk. Each powder should be mixed with 2 or 3 ounces of warm milk and water.

Salophen, a tasteless crystalline substance composed of salicylic acid (51 per cent.) and *acetylparamidophenol*, has been recommended as a substitute for the salicylates in acute rheumatism. It is given in 15- or 20-grain doses in cachets, or in powder, washed down with water, thrice daily. It cannot be said to have established the claims originally made in its behalf.

Aspirin, a more recent introduction, has received much commendation as a substitute for sodium salicylate. It is obtained by the action of acetic anhydride on salicylic acid. It is said to pass through the stomach unchanged and to set free nascent salicylic acid in the intestine. It is recommended to be given in 15-grain doses mixed with syrup and water; as much as 75 grains may be given in 24 hours. Its taste is less unpleasant than that of salicylate of sodium, and its effects are said to be as good, if not superior. It is stated to cause no gastric or intestinal trouble, nor any symptoms of collapse, to be non-irritative to the kidneys, and not attended with the toxic symptoms which occasionally arise with the sodium compound.

Salicylate of methyl, an artificial oil of wintergreen, has also been advocated as a substitute for sodium salicylate, and as a remedy for acute rheumatism, applied internally and externally. The natural oil of wintergreen has also been been similarly prescribed. Internally, salicylate of methyl may be given in doses from 60 to 150 grains a day—made into a mixture with mucilage and syrup, and a small quantity of alcohol. It is best to begin with 15-grain doses every 2 to 4 hours, and it is especially recommended in cases where the sodium salt does not agree or fails to relieve, and it is said to be more particularly useful in subacute and chronic cases. It is admitted that some patients do not readily tolerate this drug when given internally, and its *external* use has therefore been largely advocated, as it appears to be absorbed readily by the skin. About 30 to 40 drops are applied to the surface of the painful joint, which is then covered with gutta-percha tissue and a flannel bandage applied. It must not be applied in the acute stage.

Senator proposed *sodium benzoate* as a substitute for sodium salicylate in the treatment of acute rheumatism, and he gave as much as 2 to 3 drams daily. He claimed for this salt that it did not cause any toxic effects or disorder the stomach, as the salicylates do, while it was as powerful a remedial agent.

The pain-relieving properties of the salicyl compounds has led to the disuse of **opium** for the purpose of assuaging the pain and restlessness of sufferers from acute rheumatism. But this drug has, perhaps, been too completely set aside. Opium was found, before the introduction of the salicylates, a most valuable agent in allaying the pain and the cardiac excitement in severe cases, and its known influence over the capillary circulation may give it some control over the endocardial inflammation.

We still think that in cases with signs of commencing endocarditis and cardiac excitement it is a good plan after a mercurial and saline purgative to begin treatment with a full dose of opium, such as 15 grains of Dover's powder, in a draught, combined with a dram or two of acetate of ammonia, and an ounce of camphor water, and to repeat this dose nightly for three or four nights. We should then give the salicylates only during the day, as we might look to the opium to procure several hours of sleep at night. The constipating tendency of opium must be counteracted by a saline aperient in the morning. We treated many cases of acute rheumatism in this way, before the salicylates became popular, with excellent results, by a few doses of opium at the onset, together with alkalies combined with quinine.

This brings us to the discussion of the **alkaline treatment** of acute rheumatism, which we do not think should be wholly set aside for the salicylates, although we are convinced of the value of the latter. There certainly seems to be reliable evidence that free alkaline treatment diminishes the tendency to cardiac complications, and we are strongly disposed to think that the best treatment of acute rheumatism will prove to be a combination of the alkaline and salicylate treatments, together with the consumption of the largest possible quantity of **pure water** or milk and water, and this is practically the treatment we have already advocated.

Too little attention has been paid to the remarkable fact that the venous blood in acute rheumatism is rarely capable of exciting endocarditis, the endocardium of the right side of the heart enjoying almost complete immunity from inflammation. The explanation usually put forward to account for this, *i.e.* the greater functional activity of the left side of the heart, is obviously wholly inadequate. The conditions are practically the same on the two sides of the heart, save that on the *right* side the endocardium is in contact with venous blood, and on the *left* side with arterial; and it must also be borne in mind that the right side of the heart does not *invariably* escape. It would seem, then, that there is some substance in the blood, in this disease, which, after it has been brought under the influence of the atmospheric oxygen in the lungs, is rendered capable, or far more capable than it was before, of exciting, in certain circumstances, inflammation of the endocardium. The remedy, therefore, which would protect the heart, would be some agent which, when added to the blood, would prevent this effect of the respiratory oxygen upon the toxic substance in it, until it had been eliminated or destroyed. Alkalies may probably act in this way. The advocates of the alkaline treatment pushed this method a little too far; and the large quantities of the potash salts recommended by certain authorities no doubt induced serious cardiac depression in some patients.

Little objection could, however, be offered to Garrod's method, which was to give 20 grains of potassium bicarbonate every three or four hours, night and day, until the cessation of the fever, and with this he combined full doses of quinine: others have given 30-grain doses of potassium bicarbonate every three or four hours, until the urine is rendered alkaline.

Fuller's method was to dissolve 90 grains of sodium bicarbonate and 30 grains of potassium acetate in 3 ounces of water, and render this effervescent by adding an ounce of lemon-juice, and to give this dose every three or four hours until the urine became alkaline, when the dose was reduced, and only enough given to keep the urine alkaline. A tendency has recently been manifested to adopt the method we have already referred to with approval, of combining the salicylate with the alkaline treatment. We have long done so, and, we think, with much advantage. It will have been noted that, when describing what we believe to be the best dietetic management of these cases, we urged the importance of the very free consumption of watery fluids containing some alkaline salt. If the doses of the salicylates be administered, as we have suggested, in these beverages, we shall obtain a combined alkaline and salicyl treatment; while the importance of the ingestion of large quantities of water, for diluent and eliminative purposes, cannot, we think, be overestimated. Or the treatment may be commenced with 20-grain doses of sodium salicylate and 30-grain doses of potassium bicarbonate in 2 ounces of water every two or three hours, and this may be made to effervesce by adding to it a dessertspoonful of lemon-juice, or 20 grains of citric acid; when the temperature falls, the dose of salicylate may be diminished to 10 grains; and when the urine has also become alkaline the mixture may be given every five or six hours only.

We wish to repeat that we think the best substitute for sodium salicylate, and to be preferred to it in many cases, is salicin.

In patients who appear to be unduly depressed by the salicylic treatment, it is a good plan to alternate it with quinine in 2- to 5- grain doses in effervescence.*

We may now summarise the chief of the preceding recommendations thus briefly:—Opium, at first (after an aperient), to relieve the pain and nervous distress and restlessness; saline purgatives for eliminative purposes; as free a consumption of water as possible for the same purpose, and to dilute and wash, as it were, the morbid blood; salicin, or salicylates, for their special effect on the joint affection and the pyrexia; alkalies for their modifying influence on the blood and the secretions and their established influence in protecting the heart; quinine for its tonic as well as its antipyretic effects.

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* *See* vol. i., p. 609.

In lingering subacute cases, which have resisted the action of moderate doses of the salicyl compounds, *potassium iodide*, 5 grains three times a day, combined with 10 or 15 grains of potassium bicarbonate, will often be found very useful; but we cannot commend its use, as has been done, in acute cases or in the early stage.

Should evidences of *pericarditis* or *endocarditis* appear they should be dealt with according to the principles already laid down in the chapter on the treatment of these affections.*

We cannot too strongly insist on the necessity of daily auscultation and percussion of the cardiac regions in order that any change in the cardiac condition may be noted.

The occurrence of **hyperpyrexia**—and by that is meant a temperature over 105°, and continuing to rise—calls immediately for active measures for its reduction. The cold bath has been proved to be the most trustworthy means for this purpose. Dr. Wilson Fox was the first physician to apply this method in England, and the success which attended it, in his hands, even in extreme cases (in one the temperature in the rectum was 110°), encouraged others to follow his example. Recovery, however, does not always follow the cold bath treatment; death from collapse has been repeatedly recorded after reduction of the hyperpyrexia by this means, and death has occasionally occurred even during the immersion. It will be prudent, therefore, not to allow any unnecessary delay in the application of the bath; and as soon as the temperature, after steadily rising, notwithstanding such remedial measures as we have already set forth, reaches 105°, preparations should immediately be made for immersing the patient. If cerebral symptoms, such as convulsions, occur, even with a temperature of not more than 104°, we should not delay to employ the cold bath. The bath must be repeated as soon as the temperature again rises above

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* *See* vol. i., p. 336.

105°. As many as twenty-five or twenty-six baths have been given in the same case. The temperature of the bath must not be lower than 90° at first, otherwise the patient will feel an unpleasant chill on entering it; but so long as the temperature of the water is between 90° and 100° the immersion will be agreeable to him. After he has been lowered into the bath on a sheet, the temperature may be further reduced by the addition of cold water, until it reaches 75° to 70°. When the temperature in the rectum has reached 102° the patient should be removed, as the temperature will continue to fall after his removal. On his return to bed some stimulant should be given him, a blanket thrown over him, and he should be allowed to sleep; should he show any signs of heart failure in the bath, stimulants must be freely given, and he must be at once removed to bed. It must be remembered that there is a great tendency to sink from cardiac failure in these cases, and free stimulation may be needful; as much as six ounces of brandy within an hour was given to one of Dr. Wilson Fox's successful cases, and warmth had to be applied to the back, and hot bottles to the feet. If a cold bath is not procurable, the next best measure is rapidly rubbing the patient with ice. Two nurses, each with a suitably shaped large lump of ice, wrapped round with thin flannel, should repeatedly pass the ice over the whole of the anterior surface of the body, and at the same time a bag filled with pounded ice should be applied to the spine and back of the neck, and another on the head. The patient should also be constantly given fragments of ice to suck.

The favourable effects of the cold bath are to allay delirium, restore consciousness, reduce the rapidity and increase the strength of the pulse, and induce tranquil sleep, as well as lower the temperature.

It only remains to be said that the **convalescence** of a patient from acute rheumatism should be carefully watched. He should be kept in bed for a considerable time after all the symptoms of the joint affection have disappeared, and this is especially important in cases with any cardiac complication. In such cases the work of the heart should be minimised in every possible way, and chiefly by absolute rest for some weeks. The food, though nourishing, should be as light as possible, and chiefly composed of milk and farinaceous substances. Light broths, with fresh vegetables in them, are suitable; and some cooked fruit or fruit-jellies may be taken with light puddings.

We have already insisted on the propriety of continuing some salicyl preparation for a fortnight after the cessation of the acute symptoms, in order to guard against relapses.

If we give salicin, it is as well to add to each dose (thrice daily) 1 to 3 grains of quinine. On leaving off this medicine, the anæmic state which is apt to follow these attacks calls for some preparation of iron. The citrate of iron and quinine, in 5- to 10-grain doses, combined with 20 grains of potassium citrate, may be given three times a day; and when there are notable signs of cardiac debility, 3 to 4 minims of the liquor strychninæ should be added to each dose. The bowels should be kept regular by saline aperients. Patients who have had more than one attack, and in whom some cardiac affection has been left by the original illness, will require more supporting and tonic treatment during convalescence. They may require a certain amount of light animal food, eggs, soup, etc., and a small amount of some alcoholic stimulant. Cardiac tonics, such as digitalis and iron, may be needed; but prolonged rest in bed is one of the best tonics to these damaged hearts. As an attack of acute rheumatism does not protect from but rather predisposes to others, it is a wise precaution in one who has thus suffered to always wear warm woollen clothing and to have special care of the throat, since it is believed that the infective agent probably enters by the tonsils.

ADDITIONAL FORMULÆ.

Salicylate mixture for acute rheumatism.

℞ Sodii salicylatis, ʒiij.
Syrupi zingiberis, ℥j.
Aquæ ad ℥vj.
M. f. mist. A tablespoonful every three hours.
(*Prof. J. Stewart.*)

Combined alkaline and salicylate mixture.

℞ Sodii salicylatis, ℥ss.
Potassii bicarbonatis, ʒvj.
Liquoris morphinæ hydrochloridi, ʒjss.
Aquæ camphoræ ad ℥xvj.
M. f. mist. Two tablespoonfuls four times a day.
(*Whitla.*)

Pills of salicylic acid.

℞ Acidi salicylici (nat.), gr. c.
Gummi acaciæ, gr. xv.
Mucilaginis acaciæ, q.s.
Ut f. pil. xxx. Six to be taken every hour until buzzing of the ears occurs, then every four hours. (*Latham.*)

Mixture and powders for acute rheumatism.

℞ Potassii acetatis }
Potassii nitratis } āā ʒjss.
Syrupi mori, ʒvj.
Aquæ ad ℥viij.
M. f. mist. A tablespoonful three times a day.
℞ Sodii salicylatis, ʒjss.
Divide in pulv. xij. Take four powders a day.
(*Billroth.*)

Salicylate of ammonia and soda mixture.

(Said to avoid unpleasant symptoms.)

℞ Sodii bicarbonatis, gr. v.
Ammonii carbonatis, gr. v.
Acidi salicylici, gr. xx.
Aquæ ad ℥j.
M. f. haust. To be given for a dose. (*Prideaux.*)

Alkaline mixture with bark.

℞ Sodii bicarbonatis }
Potassii acetatis } āā ʒss.
Tincturæ cinchonæ, ʒij.
Decocti cinchonæ flavæ ad ℥jss.
M. f. haust. For a dose.
(*Fuller.*)

Alkaline spray for inhalation in rheumatic endocarditis.

℞ Sodii bicarbonatis, gr. xx.
Aquæ destill. ℥iij.
M. f. tol. To be inhaled for a quarter of an hour three or four times a day.

Lotion for the painful joints.

℞ Tincturæ opii, ʒv.
Potassii carbonatis, ℥ss.
Glycerini, ℥ij.
Aquæ ad ℥xij.
M. f. lotio. To be applied by means of lint. (*Fuller.*)

Application to the joints in acute rheumatism.

℞ Ichthyolis, ℥ss ad ℥j.
Adipis, ℥ij.
M. f. ung. Rub in well to the part affected. (*Hare.*)

Another.

℞ Acidi salicylici, gr. cxx.
Alcohol (absolute), ℥j.
Olei ricini, ℥iss.
M. f. linim. (*Ruel.*)

Iron and arsenic mixture for anæmia.

℞ Liquoris arsenicalis, ʒj.
Syrupi ferri iodidi, ʒix.
M. Ten to thirty drops, gradually increased and according to age, after meals twice or thrice daily. (*Packard.*)

Liniment for fixed pain in the joint.

℞ Olei sinapis, ♏xij.
Spiritus terebinthinæ, ʒvj.
Linimenti saponis, ʒvj.

M. f. lin. To be applied twice or thrice daily.

(*Bamberger.*)

Alkaline mixture in effervescence.

℞ Sodii bicarbonatis, ʒss.
Potassii acetatis, ʒss.
Liquoris ammonii acetatis, ʒiij.
Aquæ ad ℥ij.

M f. haust. To be taken in effervescence with

℞ Acidi citrici, ʒss.
Aquæ, ℥ij.

M. (*Fuller.*)

Salicin and alkaline powders

℞ Salicini, ʒij.
Potassii bicarbonatis } āā
Sodii bicarbonatis } ʒjss.

M. et divide in pulv. vj. A powder, every three or four hours, dissolved in a wineglassful of hot milk and water.

CHAPTER II.

THE TREATMENT OF DIPHTHERIA AND WHOOPING COUGH.

Diphtheria—A *Bacillary* Disease and a *Local* Disease—Nature of Infective Process—The Klebs-Löffler Bacillus—Etiology of Diphtheria—Modes of Contagion—Symptoms and Course—Pharyngeal, Nasal, and Laryngeal Forms—Constitutional Symptoms—Complications—Paralyses—*Indications for Treatment* — *Local Measures* — Antiseptic Applications — Caustics injurious — Warm Irrigations — Sprays — Paints — Corrosive Sublimate—Carbolic and Alkaline Spray—Other Local Remedies — *Internal* Medication — Perchloride of Iron — Sodium Benzoate and other Drugs—Food and Stimulants—Treatment of Nasal Form — Of Laryngeal Form — Emetics — Operative Measures — Intubation — Tracheotomy — *Specific Antitoxin Treatment* — Treatment of Convalescence — Of Diphtheritic Paralysis —Strychnine —Massage —Electricity—Prophylactic Measures.

Whooping Cough—Nature, Characters, and Symptoms—An Infective Bacillary Disease—Indications for Treatment—(1) Antiseptics—(2) Anti-catarrhal Remedies—(3) Sedative Remedies — Maintaining Nutrition by suitable Feeding—Change of Air—Prophylaxis. Additional Formulæ.

Diphtheria.

Diphtheria is an infective **bacillary** disease characterised by a membranous exudation on the mucous membrane of the fauces, nose, or larynx chiefly, and in severe attacks it is accompanied by great constitutional prostration and the occurrence of degenerative changes, especially in the cardiac muscle, the peripheral nerves, and the renal parenchyma. These degenerative changes are caused by the absorption into the blood of a specific toxin, elaborated at the seat of the exudation by a specific bacillus, which is always present, and by appropriate means can be detected there.

This is the so-called Klebs-Löffler bacillus. This microbe does not, usually, enter the blood, but produces its morbid effects by its *local* activity, which results, as we have said, in the production of a toxin that enters the blood and sets up a general intoxication. Diphtheria is thus primarily, at any rate, a local infection, although recently, in some severe attacks, the bacillus has been found in the subjacent lymphatic glands, in the pulmonary tissue, and in the spleen.

The morphology of the Klebs-Löffler bacillus is now well known, and need not be detailed here.

It is a remarkable and interesting fact that we may frequently find bacilli in the throat, either alone or in company with the true diphtheria bacillus, which are morphologically, and in their behaviour in cultures, indistinguishable from it—but they are innocent and non-infective. It is a disputed point whether these are attenuated true diphtheria bacilli or examples of a distinct species. They have been termed (incorrectly, Osler thinks) *pseudo-diphtheric bacilli.*

Besides the specific bacillus, other microbes, pyogenetic and putrefactive, may be found associated with it in the exudation in all cases of this disease, and in some cases a mixed infection, from definite septic invasion, occurs. These cases of mixed infection are almost always severe ones.

With regard to the **etiology** of diphtheria, it is known as a highly *contagious* disease. It is difficult, however, to say in what manner it originates. Has it any relation to defective drainage? It has been suggested that exposure to emanations from drains may excite a non-infective sore throat, which may serve as a suitable soil or culture ground for the diphtheria germ, when present in the air; or it may confer an infective virulence upon non-infective pseudo-bacilli already in the mouths of certain children, and thus the disease may be started. But what seem to be more influential factors than the inhalation of sewer gas are imperfect drainage of the surface soil, dampness of dwelling houses, and deficient scavenging. The diphtheria bacillus has never been detected in sewer air, nor has it ever been definitely traced to water pollution. Direct or indirect transmission from person to person is the most important and frequent mode of its diffusion.

There is no reason to believe that the virus can be conveyed by the breath of an infected patient; but by acts of coughing or spluttering when the throat is being examined and dressed, and by the discharge of saliva and buccal mucus from the mouth, or infective discharges from the nose as in sneezing or laughing, the virus may be scattered about on the bed-clothes, and on persons and articles of dress and furniture near the patient. Kissing or using the same pocket handkerchief, cup, or spoon, are clearly obvious ways of conveying infection. The virus may attach itself with great tenacity to articles of furniture, curtains, carpets, etc., in the room in which the patient has been laid up. It has been thought that cats have conveyed the disease to children, as these animals are subject to a contagious pseudo-membranous affection; and the same has been observed of fowls and calves, but it has been shown that these diseases are not identical with diphtheria in man, and cannot be conveyed to him.* The milk of a cow with a calf so affected has also been suspected to be the source of contagion, but milk might easily become contaminated—without great care—from a human source, as the bacillus grows readily in that fluid.

Childhood is a predisposing cause to this as to most infective diseases. It has been found most fatal between the second and sixth year. An unhealthy condition of the mouth and throat, enlarged tonsils, chronic naso-pharyngeal catarrh, inflamed gums from carious teeth, etc., predispose to infection. Like some other infective diseases, such as scarlet fever, epidemics vary much in their severity. In some the infective agent appears to be very virulent and spreads rapidly, and the constitutional symptoms assume great gravity; in others the disease runs a mild course and is rarely fatal.

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* Osler's "Practice of Medicine" (fourth edition), p. 139.

Individual susceptibility to this disease varies greatly—some seem to possess a singular immunity from infection, however much they may be exposed to it, and bacilli have been found growing in perfectly healthy throats in the case of attendants and nurses in hospitals!

Formerly this disease was more frequent in rural districts in England, but of late years it has shown a tendency to affect large towns, in many of which it is now more or less endemic. This is believed to be connected with "school influence" and the spread of compulsory education. The massing together under the same roof, for several hours daily, of numbers of young children, some imperfectly fed and in a receptive condition and at a receptive age for all forms of infection, certainly favours the propagation and spread of diphtheria.

It is important to remember, especially with regard to school attendance, that a child remains a possible source of infection as long as any diphtheria bacilli can be detected in the secretions of the throat, mouth, or nose. It should also be borne in mind that an attack only confers immunity for a very short time, usually only three or four weeks, when a relapse or a distinct second attack may occur.

The period of *incubation* cannot be determined precisely, but four or five days is probably the outside limit. Ten or twelve days is considered a safe period of quarantine.

It is important to remember that this bacillus is very resistant, and has been cultivated from a fragment of membrane kept in a dry cloth for five months! The bacilli will also often linger in the throat and nose for many months after all membrane has disappeared.

The clinical course and the **symptoms** of the disease vary with the severity of the attack. The onset is generally marked by difficulty in swallowing, redness of the fauces, and a rise of temperature often to 103° or higher. But diphtheria has no typical temperature curve, and some of the worst cases have a normal temperature almost from the onset. The characteristic exudation usually begins on the tonsils, and may not be distinguishable at first from that of follicular tonsillitis. The false membrane, however, soon extends, covering the tonsils and stretching to the pillars of the fauces, to the uvula, and often to the posterior wall of the pharynx.

The tonsils and the uvula and the mucous membrane covering the throat at the same time become swollen and œdematous, and the glands in the neck also often become enlarged and tender. The pseudo-membrane has at first a greyish-white aspect, but it soon assumes a dirty or yellowish-grey appearance. The membrane is firmly adherent, and if removed leaves a raw bleeding surface on which fresh exudation rapidly reappears. In favourable cases, after the fourth or fifth day the severity of the symptoms abates, the false membrane separates and is not reproduced; the swelling of the throat is reduced, and the enlarged glands in the neck become smaller, the febrile temperature disappears, and convalescence may be fully established by the ninth or tenth day. But in other cases the disease runs a more formidable course; the false membrane may extend from the pharynx along the posterior nares into the nasal cavities, and set up *nasal* in addition to pharyngeal diphtheria, and this is attended by a foul acrid discharge from the nose, and much obstruction in respiration from swelling of the nasal mucous membrane. The disease may even extend to the conjunctivæ through the lacrymal ducts, or to the middle ear along the Eustachian tube. But the most serious extension of the false membrane is into the larynx; thence it may spread into the trachea and even into the smaller bronchi.

Laryngeal diphtheria is attended by the same symptoms as membranous **croup**, and there is a very general disposition to regard cases of so-called membranous croup as really cases of laryngeal diphtheria. The symptoms now become very serious and urgent. Owing to obstructed respiration, the breathing is noisy and stridulent, the inspirations shallow and rapid, and the sternum and lower ribs and intercostal spaces are retracted in inspiration; the surface becomes cyanosed, and if the embarrassed respiration is not speedily relieved the child dies asphyxiated.

In some cases the symptoms of grave constitutional infection appear early and take the more prominent place. But generally they correspond in severity with that of the local manifestation and appear later. There is in these cases great prostration, with high fever, a small, feeble, and rapid pulse, marked disturbance of the nervous system, delirium, convulsions, etc., and the patient often sinks rapidly from the intensity of the constitutional infection. When these constitutional symptoms appear *later*, they are usually associated with extensive disease of the pharynx, sloughing, fœtid ulceration, and sometimes even gangrene, together with great enlargement of the lymphatic glands and an ashen-grey pallor of the countenance. The *nasal* form, if it occurs alone, often runs a mild course, and there is some risk of its being overlooked, which would be very serious, as the discharges from the nose, which occasionally contain shreds of membrane, are laden with diphtheria bacilli, and are therefore most infective; so that any nasal symptoms occurring during the prevàlence of this disease should be investigated with great care. Diphtheritic exudation occasionally makes its appearance on the external genital organs and on the surface of open wounds.

The chief **complications** which may occur are infective bronchitis and broncho-pneumonia, and even pulmonary gangrene and fatal hæmorrhage in the graver forms of this disease. (The *streptococcus pyogenes* is often the infective agent in such complications as suppuration of the lymphatic glands and broncho-pneumonia.) *Albuminuria* of the ordinary febrile type is present in all severe cases; but in a few it may be abundant, and due to the occurrence of parenchymatous nephritis. One of the most serious complications of diphtheria is *paralysis*. Sometimes it appears early in the disease, but more usually not before the second or third week of convalescence, and it is apt to follow mild as well as severe cases. It commonly first affects the palate and gives a nasal character to the voice, and allows of the regurgitation of fluids, taken into the mouth, through the nose. If the paralysis extends to the pharyngeal muscles, swallowing may become difficult. The ocular muscles may be paralysed, giving rise to strabismus, ptosis, and failure of accommodation. Loss of power may also appear in the extremities. The most serious form of diphtheritic paralysis is that affecting the **heart** muscle, manifested by great irregularity and often remarkable slowness of the pulse, and ending sometimes in fatal syncope; and it is important to note that symptoms of serious cardiac failure may be deferred till quite late in the attack, from the end of the second to the third or fourth week. Multiple forms of paralysis occasionally occur, and the patient is rendered entirely helpless. These various forms of paralysis are regarded as dependent on a toxic neuritis.

Diagnosis in diphtheria bears an important relation to treatment. The presence of the Klebs-Löffler bacillus is the criterion of true diphtheria. This is established or negatived by the examination bacteriologically of some of the material from the throat of the suspected patient, obtained by rubbing a sterilised swab of cotton-wool gently but firmly on the visible exudation; this is enclosed in a test-tube or properly adapted bottle, and sent to a bacteriological laboratory for examination. In purely laryngeal cases, when the swab has been rubbed freely against the surface of the pharynx and tonsils, absolute reliance must not be placed on a single culture from which the bacillus may be absent, as it may be abundant in later ones.*

To the membranous inflammations found in the throat, in which the Klebs-Löffler bacillus is not present, the name of *diphtheroid* inflammation has been given. This is, in many cases, caused by the *streptococcus pyogenes,* and it can only be distinguished with certainty from true diphtheria by bacteriological examination.

These cases, as a rule, run a milder course than those of diphtheria, but in certain fevers, as, for instance, scarlet fever, a virulent general streptococcus infection may take place which may prove fatal. Energetic local disinfection by antiseptic applications is indicated in these streptococcus infections.

The foregoing brief account of the nature and chief characters of diphtheria will help us to establish rational **indications** for its **treatment.** These may be divided into *specific* and *general*: the latter we will consider first.

1. The disease must be attacked *locally,* as quickly and as thoroughly as possible, as we may thereby prevent the local multiplication of the diphtheria bacillus as well as that of other infective microbes often associated with it.

2. The next indication is to support the constitutional vigour, and to help the system to resist or antagonise the toxic influence of the infective products of the diphtheria bacillus should they be absorbed.

3. A third indication is prophylactic, viz. to adopt measures to prevent the communication and spread of the malady. Other subordinate symptomatic indications arise in the course of the disease; such as the removal of respiratory obstruction in

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* The Jenner Institute of Preventive Medicine, Chelsea Gardens, Grosvenor Road, London, S.W., provide "specially prepared tubes and boxes for the forwarding of specimens, price 1s. 3d. The membrane may also be forwarded in sterilised glass tubes or between folds of dry lint or blotting paper."

laryngeal cases, by operation if necessary, and the treatment of the paralysis which so frequently occurs as a sequel to this disease.

The success of the **local treatment** best calculated to fulfil the first indication will depend on the thoroughness with which it is applied and the opportunity we may be afforded of applying it *early*. **Early** application of antiseptic and specific measures is of chief importance. In the *early* stage the poison is probably quite superficial, and can be destroyed by suitable antiseptic applications. But if the local disease has existed for some days before these are applied, there has been time then for the constitution to become affected by absorption of the toxin elaborated at the seat of infection. The extension also of the local morbid process into the air-passages is far more likely to occur when there has been any neglect of adequate early treatment of the pharyngeal manifestations, and it is this particular complication that proves so very fatal, not only because of the respiratory obstruction it produces and the serious operations necessitated for its relief, but probably because, in these cases, the constitutional infection is more intense, and the infective virus has reached a tract of mucous membrane which is more out of reach of our local remedies.

The **local** treatment should consist in the frequent and thorough application of **antiseptic** agents. Caustics are injurious, and should be avoided. They favour the extension of the false membranes by the injury they do to the adjacent sound mucous membrane, which they denude of its protective epithelium and irritate and inflame, and so produce a condition favourable to the attack of the infective microbe, and by provoking reactionary tumefaction they aggravate the dysphagia already existing.

At the same time an antiseptic application must be used of sufficient strength to be really efficacious.

If we can detach, or wash away, the false membrane while making our antiseptic applications, it is certainly advantageous to do so; but no violence should be used.*

It is as well to remember that the virulence of the diphtheria poison is attenuated by moist heat and destroyed at a temperature of 137° F. We should therefore use our applications as hot as they can be borne without injury to the mucous membrane.

Vigorous **irrigation** with hot water or hot aqueous solutions of borax, or boric acid, or potassium chlorate, is one of the best mechanical means of detaching and washing away the false membrane. The following solution may be used very freely:—Borax, boric acid, of each 2 drams; chlorate of potash, 1 dram; glycerine, 4 ounces; hot water, a pint.

These irrigations should be made frequently, with a syringe capable of giving a strong jet of fluid. If we have to do with an infant or a restless young child, it is best to wrap its body and arms tightly in a shawl so that it cannot struggle, and for the nurse to hold it on her knees with its head firmly supported on her chest. Another assistant should hold a basin under the child's chin. The nose must be pinched, and as soon as the child opens its mouth a piece of wood should be placed between the molars, and then the nozzle of the syringe or irrigator should be directed with a strong jet to every point of the throat and fauces. After the throat has been thus cleansed (adults can use the hot fluid as a gargle for the same purpose) the stronger antiseptic agent we have determined to employ may be applied by means of a pulverising apparatus (and this is best if the nose or larynx should be attacked) or by means of a pledget of cotton-wool firmly tied on to a piece of stick (to be burnt immediately after use). This is the best method of applying strong antiseptic agents, which we cannot conveniently use, of the same strength, as a spray. These applications must be made with gentleness and so as to do no injury to the inflamed mucous membrane. One of the best local applications in pharyngeal diphtheria is the *perchloride of mercury*; but it is generally used in too dilute solutions. For adults and for older children a 1 per cent. solution in alcohol may be used by means of cotton-wool or a fragment of sponge (tied on to a stick) dipped in the solution, and the excess of fluid pressed out before it is applied to the throat. The application should be made three or four times a day, and by using a strong solution such as this, which is brought into contact only with the infected parts, very energetic antiseptic action is ensured. We have used for younger patients an aqueous solution of 1 in 500 in the same way and very successfully. Others employ weaker solutions and apply them much more frequently, or use them as a spray (1 in 1,000 to 1 in 5,000 of water). In the latter case it should be used as hot as it can be safely applied. For *nasal* diphtheria the spray recommended by Jacobi is a good one. It is made with 1 part of bichloride of mercury and 35 of chloride of sodium to 1,000 of water.

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* The substances that have been used to dissolve the false membranes are lime water, lactic acid (5 per cent. solution), solutions of pepsin and of papain, lemon juice, solution of neurin (Ludwig), solutions of chlorate of potassium and chlorate of sodium, and peroxide of hydrogen. These have fallen into disuse since the general adoption of the antitoxin treatment.

We prefer, however, to use the stronger solutions for pharyngeal cases, and to protect the air-passages from infective invasion we employ, at the same time, the following spray, which, by means of a Seigle's steam spray-producer, we keep playing in front of the child's mouth and nose (if very young and unable to inhale) as constantly as possible: Glycerine of carbolic acid, 6 drams; sodium bicarbonate, 60 grains; and hot water, 6 ounces. By a suitable contrivance the air around the child's head can be kept nearly saturated with this spray, which thus enters, in some amount, into its larynx and trachea.

One of the advantages of the alkali and the glycerine is that the spray is enabled to **wet** thoroughly the mucous membrane with which it comes in contact.

Many other local applications have been employed, such as a saturated solution of boric acid; a solution of methyl-blue (1 to 9 of water); a 10-volume solution of peroxide of hydrogen (strongly objected to by Crandall on account of its irritating effects); strong solutions of potassium chlorate; chlorine water; sulphurous acid spray; carbolic acid 3 parts, alcohol 30 parts, to water 67 parts; the tincture of perchloride of iron diluted with 2 to 5 of water and glycerine; insufflation of sublimed sulphur; painting with tincture of iodine, with tolu varnish, with petroleum, with a 2 per cent. solution of creolin, etc. etc. Löffler stated that ferric perchloride killed the diphtheria bacillus very rapidly, and his local application consisted of 4 c.c. of liq. ferri perchloridi, 10 grammes of menthol dissolved in 36 c.c. of toluol, and absolute alcohol 60 c.c.

Suitable internal remedies are also needed to maintain the forces of the organism, and to enable it to resist the invasion of the toxic agents developed at the seat of infection. The strongest testimony is borne by a host of observers to the efficacy of the internal administration of **perchloride of iron;** a part of this efficacy we believe to be due to its antiseptic action on the infected throat as it is swallowed. For a child of one year 2 minims and for a child of three years 5 to 10 minims of the tincture with 1 to 3 grains of potassium chlorate in a teaspoonful or two of syrup and water should be given every hour. Larger doses must, of course, be given to adults.

For an adult or a child over ten years of age the following is an excellent mixture :—

℞ Tincturæ ferri perchloridi	♏ cc.
Quininæ sulphatis	gr. xxiv.
Potassii chloratis	gr. xlviij.
Aquæ chloroformi	ad ℥viij.

Misce, fiat mistura. A tablespoonful with one of water every hour or two, according to the severity of the case.

Sodium benzoate is a valuable antiseptic for internal use for children. The following is a formula for its administration :—

℞ Sodii benzoatis	... ...	ʒijss.
Syrupi aurantii	... ...	ʒv.
Aquæ menthæ piperitæ	... ...	℥iij.
Aquæ ...	... ... ad	℥vj.

Misce, fiat mistura. A dessertspoonful every hour (for a child of three years). The dose is increased with the age of the child.

The internal use of *biniodide of mercury*, salicylic acid, sodium salicylate, turpentine, thymol, helenine, have all been credited with curative powers in the treatment of this malady.

Judicious *feeding* is an important element in the treatment of these cases ; fluid or semi-fluid foods only can be given, milk, nutritious broths and soups, beaten-up eggs, pounded meat mixed with light broth, coffee with milk, cocoa, and a due amount of alcoholic stimulant should be given regularly at stated intervals. Refractory children, or others, may be fed by enemata of peptones. Any indications of cardiac failure must be met by an increase in the amount of wine or brandy, which should be given at short intervals, until the action of the heart improves. Small doses of digitalis may be needed, and hypodermic injections of ether, or of caffeine dissolved in solution of sodium benzoate, should be resorted to in the graver forms.

Nasal diphtheria may arise primarily, but it is more commonly an extension from the pharynx into the posterior nares. Its occurrence by extension usually indicates a severe form of the disease, and the constitutional infection is apt to be severe. Irrigation and spraying of the nasal cavities must be diligently carried out with the carbolic acid and sodium bicarbonate spray we have already mentioned, or borax or potassium chlorate in weak solutions with glycerine may be used ; or a weak solution of corrosive sublimate may be employed as a spray and an oro-nasal respirator worn, the sponge of which is kept saturated with turpentine or eucalyptol.

Laryngeal diphtheria may also be primary or secondary; more commonly, like the nasal form, it is an extension of the false membrane downwards from the pharynx.

When this serious complication occurs with a child, its bed should be enclosed in a tent, and the enclosed space kept saturated with steam from a kettle provided with a long tube, as shown in Fig. 2. If a piece of sponge is attached to the end of the tube and kept moistened with turpentine, eucalyptol, or pinol, the air of the tent will become charged with these antiseptic vapours.

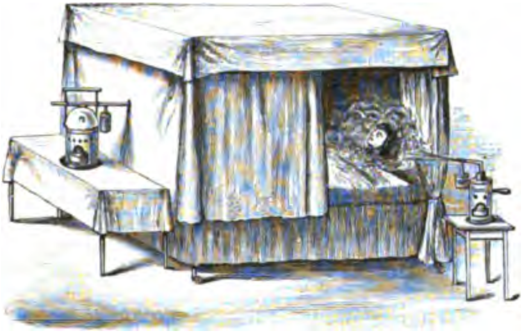

Fig. 2.—Tent with Spray Apparatus for Laryngeal Diphtheria.

In these cases the maintenance of a hot spray of carbolic acid and sodium bicarbonate (as already formulated) playing in front of the mouth and nostrils by means of a large spray-producer, as shown in Fig. 2, is of the greatest service.

In very young children a piece of blotting paper or lint may be fastened on to the bib, or round the neck, and kept saturated with spirits of turpentine, pinol, or eucalyptol, so that the vapour may be continuously inhaled.

The internal administration of corrosive sublimate has been specially advocated when this complication threatens, and as much as half a grain has been given daily in divided doses to a child a year old. The usual dose is about $\frac{1}{100}$ grain every hour in milk. It must not be continued more than three or four days.

Emetics are often prescribed at this stage to promote the expulsion of false membranes formed in the larynx and trachea, and sometimes with success; for this purpose ipecacuanha or sulphate of zinc may be used. Apomorphine is, we consider, too depressing an agent to be employed in this disease.

If vomiting fails to relieve, and the signs of respiratory insufficiency remain urgent, **tracheotomy** or **intubation** must be performed. It is not desirable to wait until the respiration has become greatly impeded before we operate, as the chances of recovery are greatly imperilled by delay. *Intubation* has not met with so much support in England as in Germany and America. So far as statistics show, the recoveries after either of these operations are about equal. It has been suggested that intubation is the preferable operation in the following circumstances: (1) in children under 3½ years of age, (2) in adults, (3) in the homes of poor persons, or whenever continuous skilled attendance is difficult to procure. It is unsuited to cases in which the trachea is probably crowded with membrane.

The tubes inserted should be previously well soaked in hot antiseptic fluid, and the inner tracheotomy-tube should be removed every half-hour and similarly treated before its reintroduction. The outer tube should be cleansed with a feather (to be immediately burnt) of any adherent secretions or fragments of membrane; it should be removed and cleansed after twenty-four hours. The atmosphere around the patient should be kept saturated with steam and antiseptic vapours as already described.

SPECIFIC TREATMENT BY ANTI-TOXIN.

But the *most important* indication is to bring the patient as rapidly as possible under the influence of the *specific* treatment by *anti-toxic* serum. The introduction of this mode of treatment was based on the observation that a substance is present in the blood-serum of immunised animals which has the power of conferring a certain degree of immunity on other animals, and even of arresting the disease after it has become developed.

The method was first introduced by Professor Behring, one of Koch's pupils, and to him and Kitasato belongs the honour of this discovery.

The immunising serum is thus prepared. In the first place, the *toxin* is obtained in considerable quantity by cultivating the virulent diphtheria bacillus in a suitable medium; the cultures are filtered, and a clear liquid containing the toxin is obtained.

The next step is to *immunise* the animal that is to be used for the production of the anti-toxic serum. Great caution and care is needed in carrying out this process, which need not here be detailed.

The horse is the easiest animal to immunise and from which to obtain large quantities of serum. This animal bears the process better than any other. Moreover, its serum is not injurious to man; injected under the skin, it is quickly absorbed and causes no local irritation. It is easy also to withdraw large quantities of blood from the jugular vein of the horse from which a perfectly clear serum separates. The process of immunisation of each horse takes about three months.

This serum possesses both curative and prophylactic powers, and the quantity needed in each case will vary according to the concentration of the serum, the amount of toxin developed in the body, and the period at which the injection is first made; it is independent of the age of the patient, but depends wholly on the gravity of the attack. Its power is due to a substance termed "*anti-toxin*," of the actual nature of which, as of that of the diphtheritic "*toxin*," we know nothing. The immunity against diphtheritic *toxin* acquired by animals injected with this *anti-toxin* does not last long, and may disappear in a few days or a few weeks, according to the strength and the amount of the serum employed.

How and in what manner the anti-toxin acts is not known. Several preparations are in the market by different makers, and reliable supplies can be obtained from most of the well-known manufacturing chemists. The therapeutic potency of these preparations is calculated in *units*. One unit is the amount of serum that will fully neutralise 10 lethal doses of toxin in a medium-sized guinea-pig. The quantity employed for each injection varies usually from 5 to 20 or more cubic centimetres, according to the strength of the preparation. These doses are supplied in hermetically closed phials, the whole contents of which should be injected at once, subcutaneously, in either flank or between the scapulæ. The skin must be previously thoroughly cleaned with an antiseptic lotion and the syringe also completely sterilised. "The syringe, both before and after use, should be thoroughly washed with cold water, then boiled for five minutes."* If the patient is seen early, and the disease is only of average severity, a moderate dose may be given of 1,500 or 2,000 units, and it is usual to continue injecting half this dose every 24 hours until the membrane begins to separate; but if the disease has assumed a severe form and this treatment is not applied early, large doses of serum must be given, not less than 4,000 to 8,000 units at each injection. Larger doses than these are urgently advised by some American authorities; when we have to deal with "very severe and apparently hopeless cases," as much as 10,000 units, repeated four or five times if needful.† In this country we rarely exceed

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* From directions issued by the Jenner Institute of Preventive Medicine.

† Dr. McCallum, of the Boston City Hospital, quoted by Osler, "Practice of Medicine" (fourth edition), p. 156.

8,000 units, repeating the injection every 8 to 12 hours until its characteristic effects and definite improvement have set in, *i.e.* the membrane begins to shrivel and separate, the swelling of the fauces abates, the nasal discharge lessens, and the patient's general condition and aspect show an obvious improvement.

The prophylactic dose is much less, from 200 to 500 units. The immunity does not last longer than three weeks. The serum is said to keep active for a year, if it is preserved in a cool place, an ice-safe if possible, unopened and protected from light.

The only ill effects that have been observed as attributable to the serum are the occurrence of urticarial and other eruptions, together with some pains in the joints and a little fever, a week or ten days after the treatment.

The result of this treatment, as carried out in the hospitals of the Metropolitan Asylums Board, has been to reduce the mortality from 28·5 to 12·01 of all cases. In the Boston City Hospital, according to Osler, the mortality has been reduced from 46 to 12 per cent. The best results are obtained when the treatment is begun early. "Among 4,120 cases reported by the American Pediatric Society, the mortality of those receiving the injection on the first day was 4·7 per cent.; second day, 7·4 per cent.; third day, 8·8 per cent.; fourth day, 20·7 per cent.; fifth day, 35·3 per cent. The rule should be to use the serum in every suspected case without waiting for a positive diagnosis."*

Great care is needed during **convalescence.** To avoid the danger of sudden attacks of syncope, the patient must be kept in the recumbent position as much as possible, and not allowed to feed himself. Nourishing food and stimulants must be freely given. Should symptoms of **paralysis** appear, the patient must be kept at rest and all exertion forbidden. If there is much difficulty in swallowing from pharyngeal paresis, it may be advisable to feed the patient with the stomach-tube. In the chronic cases electricity and massage may help in the restoration of the nutrition and power of the muscles.

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* Crandall, in Hare's "System of Practical Therapeutics" (second edition), vol. ii., p. 223.

For children gentle massage and friction are preferable, as they are alarmed and fretted by electrical appliances.

In applying electricity, the slowly interrupted current is the best—the negative pole being placed over or as near as possible to the affected muscles, and the positive pole at the back of the neck, if the muscles of the upper part of the body are affected, and over the lumbar region when those of the lower limbs are involved. In regulating the current the object should be to excite muscular contraction without causing more pain than is unavoidable.

In cases in which recovery is long delayed the injection of small doses of strychnine into the muscles has been attended with much benefit. It must be remembered, however, that diphtheritic paralysis tends to disappear spontaneously in a few months, although it may sometimes persist much longer; but there can be no doubt of the value of strychnine as a cardiac tonic in these cases. It may be given in the following combination:—

℞	Ferri et quininæ citratis	gr. lxxx.
	Liquoris strychninæ	♏xxxij.
	Acidi hydrochlorici diluti	♏lxxx.
	Aquæ chloroformi	ad ℥viij.

Misce, fiat mistura. Two tablespoonfuls twice or three times a day, an hour after food. (For an adult.)

Or the following for a child:—

℞	Syrupi ferri phosphatis	℥j.
	Calcis hypophosphitis	gr. xlviij.
	Quininæ sulphatis	gr. xxiv.
	Liquoris strychninæ	♏xlviij.
	Acidi phosphorici diluti	ʒss.
	Aquæ	ad ℥iv.

Misce, fiat mistura. One or two teaspoonfuls, according to age, twice or thrice daily.

Should a patch of diphtheritic false membrane appear on the skin, as it may do occasionally from the bacillus falling on some abrasion of the surface, it should be removed by forceps and the raw surface well washed with a 1 in 1,000 sublimate solution, then covered with naphthol camphor (see formulæ at end of chapter), and a small piece of cotton-wool fixed over it with collodion.

Prophylactic measures are most important. The patient with diphtheria must be strictly isolated, and other children in the house or family should be, if practicable, removed elsewhere. If this is not possible, they should be placed in a part of the house remote from the patient, and be made to use a disinfecting mouth wash three or four times a day, such as the following:—

℞	Potassii chloratis pulveris	ʒij.
	Glycerini boracis	℥j.
	Acidi borici	ʒij.
	Glycerini acidi carbolici	℥j.
	Aquæ menthæ piperitæ	ad ℥xij.

Misce, fiat gargarisma. To be shaken up and mixed with an equal quantity of hot water when used.

The danger of kissing and fondling is obvious.

Nurses and medical attendants can protect themselves from infection, when making applications to the throat, by folding pieces of stiff paper into the shape of a large oro-nasal respirator, so as to cover the mouth and nose, and attaching it with elastic thread behind the ears on making each application, and it can be burnt immediately afterwards.

The room selected for the patient should be large and airy, and it should have an open fireplace. It is best at the top of the house, as it is more difficult to maintain effective isolation on the lower floors. "Carpets, mats, curtains, ornaments, and all unnecessary articles of furniture should be removed. A sheet kept wet with disinfecting solution should be hung outside the door. Special attendants should be provided, and no others permitted in the sick-room.

Dusters, towels, clothing, bedding, and utensils used in the room should be kept there and washed there, and not allowed to be carried through the house or used elsewhere. Soiled clothes, etc., should be covered with a boiling disinfectant solution before being taken from the room, and great care exercised in washing them. The discharges from the nose and throat (after gargling, etc.) should be received in an earthenware or glass vessel containing (hot) sublimate solution (1 in 5,000), or on pieces of clean, old, soft linen, which should be burned immediately. The evacuations should be received in glazed earthenware utensils containing sublimate solution (1 in 5,000). Cats, birds, dogs, or other household pets should not be allowed in the room, for they are often the means of spreading infection. The room should be kept clear of **flies**, for they, too, have been accused of bearing infective particles from room to room and from house to house." The patient should not be given *books or journals or toys* that cannot be immediately destroyed. Food must not be left in the sick-room uncovered and unprotected, and milk especially needs protection, as it is most apt to absorb impurities from the air.

At the same time that the room is kept well ventilated, some vaporisable disinfectant should be diffused through the atmosphere of the apartment, such as the following:—Carbolic acid and oil of eucalyptus, of each 6 drams, and spirits of turpentine, 4 ounces.

A tablespoonful of this mixture may be put on a hot-water plate, or it may be vaporised more rapidly from the surface of boiling water in a suitable vessel kept heated by a spirit lamp. It is most important to remember that the infective bacillus may remain in the mouth for some time after the false membranes have disappeared from the throat; a child, therefore, who is convalescent from diphtheria must be still kept for some time—four or five weeks—apart from other children, and during this time a disinfecting mouth wash should be regularly used, and the oral secretions should be submitted to bacteriological examination, to make sure of the absence of the organism of diphtheria. In the *nasal* form the acrid discharges from the nose are apt to remain virulent long after the other symptoms have disappeared, and such children should be especially kept from contact with others, and the nasal passages frequently washed out with a suitable disinfectant.

Another important precaution for the purpose of preventing the development and spread of this disease is to cause all persons with acute anginal attacks, whether pseudo-membranous or not, to use antiseptic gargles or sprays, especially at times when diphtheria is prevalent.

Finally, as we have already stated, children and others, but especially the former, who may be exposed to the diphtheria infection, should receive an immunising injection of anti-toxin, 300 units for a child, 500 for an adult. As we have said, however, the immunity thus obtained does not last long, and the injection should be repeated after a few days.

WHOOPING COUGH.

This epidemic, infective disease is characterised by a catarrhal condition of the air-passages, attended by a peculiar paroxysmal cough, often of great violence and intensity. The cough characteristic of this disease comes on in paroxysms, and consists of a series of rapid, short, explosive, expiratory efforts, and then a long-drawn, loud, *whooping* inspiration; this is repeated several times, according to the severity of the paroxysm, and usually ends with a more or less abundant discharge of extremely tenacious, viscid, stringy mucus, and at the same time the contents of the stomach are often expelled by vomiting. These paroxysms occur with varying frequency: in slight cases perhaps not more than three or four times in twenty-four hours, but in severe cases they recur with alarming frequency, even fifty to sixty attacks during the day and night, being usually more frequent at night. The child learns to dread these attacks, and often runs to its mother or clings to its nurse when it feels the attack coming on. Sneezing sometimes accompanies the paroxysmal attacks.

In prolonged and violent paroxysms the child becomes cyanosed, its eyeballs protrude, the face and neck become swollen, the conjunctivæ injected or even ecchymosed; blood occasionally pours from the nose, and sometimes appears in the expectoration; in rare instances the tympanum is ruptured and blood may be discharged from the ear. Convulsions are not uncommon in infants, and cerebral hæmorrhage has been known to occur. As may readily be imagined, the frequent and long-continued succession of these violent, convulsive, expiratory efforts is apt to lead to injury of the pulmonary tissues; bronchitis and broncho-pneumonia with lobular collapse are frequent complications, and pulmonary emphysema is developed, and may remain and cause habitual shortness of breath in after-life. Even pneumothorax has been known to occur. The bronchial glands are frequently enlarged (probably from an extension of the infective poison to them) and may become caseous.

Small ulcers have been observed to form under the tongue near the frænum, and are supposed to be caused mechanically, during the severe paroxysms of coughing, by the frænum of the tongue being thrust against the lower incisors.

Whooping cough is usually a disease of infancy and childhood, but it occasionally occurs in adults and even in aged persons. It is one of the most formidable diseases of early life, and, next to scarlet fever, is the most fatal of the infective diseases to which infants and young children are exposed. It is highly contagious, and one attack usually proves protective from others. It is probably conveyed (and sometimes by a third person) in the clothes or perhaps the hair, and domestic pets, dogs, cats, etc., may also undoubtedly be the means of spreading the contagion; the contagious material being contained, doubtless, in the mucus which is discharged from the air passages, and which may fall upon and adhere to surrounding objects. The characteristic paroxysmal cough is usually preceded (after an incubative period variously estimated at from four to eighteen days) by ordinary bronchial catarrh and coryza with slight feverishness, which may last from a week to ten days, and the occurrence of these symptoms in a child, especially if the cough is unusually frequent and obstinate, when the disease is known to be epidemic, should induce us to regard and treat the disease as whooping cough. Sometimes the characteristic cough never appears.

If allowed to run its course it lasts from six weeks to eight months, the paroxysms of cough gradually lessening in violence and the expectoration becoming looser and more puriform. Whooping cough is prone to follow measles, but what the precise relation is between the two infections is not known. Unlike other infective diseases, there is generally no fever during the characteristic stage, and the child appears quite well between the paroxysms unless any complication arises.

This disease probably depends on an infective micro-organism; several have been found in the expectoration and cultivated; but it is not certain whether the true virulent microbe has as yet been isolated.

Koplik and others have described a bacillus in the sputum which it is thought may prove to be the specific microbe.*

Early childhood is a predisposing cause, the greatest number of cases occurring between one and two years of age. Wintry, wet, and inclement weather favour the severity and duration of attacks, while in the warm summer season attacks are prone to be milder and of shorter duration. While an abundance of *fresh* air is conducive to recovery, exposure to a damp or cold atmosphere tends to excite serious complications. It is therefore extremely important to protect the child from taking cold. His room should have an equable temperature of about 65° F., and it is advantageous, when practicable, to have two rooms, one for night, the other for day use, so that one can always be freely ventilated when the other is occupied.

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* Osler's "Practice of Medicine" (fourth edition), p. 92.

In seeking for **indications for treatment** in this disease, those who have approached this subject with the belief that the *most important* one is to endeavour to exert some *antiseptic* influence over the virus developed by a micro-organism in the air-passages, and possibly in the system, have met with *far better results* than those who have ignored that obvious indication. Even the old and much approved quinine treatment may be regarded as, in fact, anti-toxic!

Another indication is to endeavour to render more fluid and less viscid and adherent the expectoration, the bringing up of which, often in considerable quantity, usually terminates the paroxysm. If we lessen the tenacity of this secretion so that it can be readily expelled, we shall thereby shorten the paroxysms of cough and lessen their intensity. A third indication is to quiet nervous excitement and spasm.

The treatment of whooping cough is, then, threefold: (1) Antiseptic, (2) anti-catarrhal, and (3) sedative.

(1) Our own experience has convinced us of the great value of **carbolic acid inhalations** in the treatment of this disease. But it is better not to use them at all than to use them, as many do, in a wholly inadequate manner. The child or children should be placed in a small or moderate-sized bedroom containing an open fireplace; a large iron dripping-spoon should be kept by the fireside and made hot from time to time, and carbolic acid vaporised by putting a teaspoonful or two into the heated spoon. The room thus soon becomes filled with carbolic vapour, and it should be strong enough to make

the atmosphere unpleasant to others, which has the advantage of keeping those out of the room who are not wanted there.

The nurse should be instructed to keep up this impregnation of the atmosphere with carbolic acid fumes night and day. Moreover, for *direct* inhalation we use, every hour or two, for fifteen minutes at a time, a spray of 1 dram of glycerine of carbolic acid and 10 grains of sodium bicarbonate to each ounce of hot water. However young the child may be, there is no difficulty in keeping this spray constantly playing in front of his mouth and nose, so that he is compelled to inhale it (as shown in Fig. 2, p. 591). In addition to this we cause a warm spray of a 5 per cent. solution of carbolic acid to be frequently diffused through the air over and around the patient's bed. A large Siegle, or some modification of Siegle's, steam spray-producer should be employed for this purpose. With very young infants who cannot inhale we have often caused the pharynx and fauces and upper part of the larynx, so far as accessible, to be brushed twice a day with glycerine of carbolic acid, and sometimes with surprisingly good results.

Of this method Oertel says: "I have tried carbolic acid, and certainly obtained more favourable results than with the methods hitherto employed. The youngest of these patients was my own little daughter, 1¼ years old, who was laid low by the most violent symptoms, rapidly succeeding paroxysms and fits of coughing. Inhalations of a 5 per cent. solution of carbolic acid were ordered in the following manner:—A small space about 1½ metres in diameter in the child's room was shut in by Spanish screens, and washstands hung with carpets and cloths; the child and her nurse were placed in this, and a 5 per cent. solution of carbolic acid was pulverised for an hour, at a distance of about one metre. The treatment was repeated four times in the day, while the child was kept the rest of the time partly in the same space, partly in the same room. On the first day of the inhalations the symptoms increased, and on their second reached their climax. From that time there was a rapid decrease of them; the paroxysms diminished in number and in violence; the frequent vomiting which had already disturbed the child's nutrition became less frequent, and disappeared, together with the paroxysms, after eight days' steady application of the inhalations of carbolic acid."*

The urine should be regularly inspected, and if any discoloration occurs the inhalations should be suspended for twenty-four hours. Some prefer to diffuse through the apartment the vapour of oil of eucalyptus, or turpentine, or tincture of benzoin.

Dr. Suckling and others have given carbolic acid *internally* with good results. Suckling says the duration of the attacks has been shortened by one-half. He gives half a minim with three minims of glycerine in a little peppermint water for a child a year old, and increases the dose with the age of the child.

We give sodium benzoate internally in combination with sodium bicarbonate and ammonium chloride; this mixture exerts a very favourable effect on the paroxysms of cough, and renders the expectoration less tenacious and more fluid. The following is the formula we use:—

℞	Sodii benzoatis	gr. lxxij.
	Sodii bicarbonatis	gr. xlviij.
	Ammonii chloridi	gr. xxiv.
	Aquæ chloroformi	℥j.
	Aquæ anisi	ad ℥iij.

Misce, fiat mistura. One to four teaspoonfuls, according to the age of the child, in a little hot milk, every four hours.

Professor Widerhofer, of Vienna, uses inhalations of solution of quinine (40 grains to 3 ounces of water), as well as inhalations of carbolic acid, and he also has the throat painted with a 5 per cent. solution of hydrochloride of cocaine, which he considers especially serviceable in allaying the tendency to vomit. Quinine *internally*, in full doses, has also been found to shorten the course of the disease. Its use is warmly commended by many authorities. Sticker, of Giessen,* places it foremost of all the remedies for whooping cough. He would give a grain and a-half three times a day to a child a year old and twice as much to one two years old, and would increase the dose in the same proportion with the age of the child. He recommends the hydrochloride on account of its solubility, but we would advise the substitution of *euchinin*, which is as efficacious, and being tasteless, can be readily given to children mixed with a little syrup and water, and if followed by a drink of lemonade the acid in the latter will promote its solution in the stomach. It should be given immediately after a paroxysm, so as to avoid its rejection by vomiting. Insufflations of quinine into the throat and nose are recommended by Professor Norman Bridge.† His formula will be found at the end of this chapter. Professor Monti, of Vienna, claims that great service is rendered by an inhalation of a 1 per cent. solution of carbolic acid, and he also uses inhalations of tar-water and sulphurous acid fumigations. The latter have been recommended by many. The patient is removed from his bedroom in the morning, and sulphur is then burnt in it in the proportion of 6 drams per cubic yard, the corridors and doors being kept shut for five hours. The room is then freely ventilated till the air can be breathed with safety; the child, in fresh clothes, is then brought back to the room and put to bed. It is said he sometimes awakes cured the next morning. The inhalation of ordinary coal-gas, diluted with air until it becomes respirable, has been found very efficacious. Bichloride of mercury sprays have been used, 1 in 2,000, and painting the larynx and surrounding parts with a 2 per cent. solution of *resorcin* or with very weak solutions of *formalin* has been highly spoken of.

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* Oertel's "Respiratory Therapeutics," Ziemssen's "Handbook of General Therapeutics," vol. iii., p. 321.

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* Nothnagel's "Encyclopædia of Practical Medicine," English edit., art. "Whooping Cough," 1902.

† Hare's "System of Practical Therapeutics" (second edition), vol. ii., p. 296.

Bromoform is an antiseptic fluid which has manifested remarkable efficacy in the treatment of this affection. Senator, Löwenthal, and others speak most highly of its effects. It is given in doses of from 1 to 4 drops, thrice daily, to children a year old; from 3 to 4 drops, three or four times a day, to those from two to four years of age, and from 4 to 5 drops to those from four to eight years of age, according to the frequency of the paroxysms. Care must be taken to keep the drug in the dark, in well-stoppered bottles, as it is decomposed by exposure to sunlight, and then becomes useless. It is found to diminish the frequency and severity of the paroxysms, to prevent vomiting, and to shorten the duration of the disease; even those who do not admit that it shortens the course of the disease confess that it greatly abates its severity. Owing to its being a heavy, oily liquid, not miscible with water, accidental administration of an over-dose has occasionally occurred. This risk can be avoided by giving it in an emulsion and shaking the bottle well before it is given the patient. Martindale recommends the following formula:—Bromoform, 30 minims; tincture of senega, 3½ drams; syrup of orange, ½ an ounce. Shake well and add water gradually to 6 ounces. The dose of this mixture is 2 to 4 teaspoonfuls.

(2) *Anti-catarrhal*, like *sedative*, remedies are only directed to the relief of symptoms.

The benzoate of sodium mixture which we have already formulated is an excellent anti-catarrhal remedy, and by facilitating expectoration eases the paroxysms of cough. If the expectoration continues very tenacious notwithstanding, we should add to this mixture small doses, ½-grain and upwards, of potassium iodide. Ems and Bourboule waters are very useful expectorants in the catarrhal stage, which usually follows, for a time, the cessation of the paroxysmal attacks. A tablespoonful or more with an equal quantity of hot milk should be given three times a day. Bamberger recommends that some sodium bicarbonate should be dissolved in hot water sweetened with sugar and a mouthful given to the child the moment the attack comes on. If there is any rise of temperature and danger of catarrhal pneumonia in a strong, full-blooded child, Sticker urges the immediate administration of an emetic—a teaspoonful of antimonial wine every 10 minutes till it acts—in children under two or three years of age, followed by drinks of hot water. Before the emetic is given, the bowels should be emptied by an enema.* In less urgent cases, such expectorants as squill and ipecacuanha and ammonium chloride may be given.

(3) Of the *sedative* agents that have been directed to the relief of the nervous spasmodic element in this disease, *belladonna* is, perhaps, the most popular of all, and has been given in quite large doses. Usually the doses are increased until it causes slight dryness of the throat and flushing of the face. Formulæ for its use will be found at the end of the chapter. Adults may advantageously take *atropine* in its place, commencing with the dose of $\frac{1}{200}$ grain.

But the most reliable sedatives in this affection are morphine, chloroform inhalations (which have the advantage of being antiseptic as well as sedative), chloral, and the bromides. Either of these remedies may be combined with others, but they must, of course, be given with great caution.

Morphine must not be given when there is much co-existent bronchial catarrh, lest it should check expectoration, and it should be used only to allay the spasm and nervous restlessness in severe cases, and especially for the nocturnal attacks. The following is a useful combination:—

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* Nothnagel's "Encyclopædia of Practical Medicine," English translation, art. "Whooping Cough."

℞ Morphinæ hydrochloridi		gr. ¼.
Sodii bromidi		ʒss.
Aquæ laurocerasi		ʒij.
Aquæ chloroformi	ad	℥jss.

Misce, fiat mistura. One to three teaspoonfuls for a dose, according to the age of the child.

It may often also be advantageously combined with small doses of tartar emetic.

Or chloral may be given in the following form:—

℞ Chloral hydratis		gr. xvj.
Sodii bromidi		gr. xxxij.
Aquæ chloroformi	ad	℥ij.

Misce, fiat mistura. One to four teaspoonfuls for a dose, according to age.

Chloral may also be given in rectal injections. It is perhaps the most useful of all remedies when convulsions occur, and in cases when the sleep is constantly disturbed by paroxysms of cough. Butyl chloral has been given instead in doses of 1 grain every hour.

Chloroform may be inhaled pure from a cone of blotting paper, from 5 to 20 minims at a time, according to age; or it may be combined with an equal part of eucalyptol or spirits of turpentine, and inhaled from the sponge of an oro-nasal respirator.

The application, three times a day, of a 5 per cent. solution of cocaine, brushed over the pharynx, palate, root of tongue, and as low down as possible, so as to allow a few drops of the solution to enter the larynx, if possible, has been found to have a very sedative effect.

The special value of these sedatives is to quiet nervous excitement, and to save the child's strength, which the repeated paroxysms of spasmodic cough tend to exhaust. By thus conserving the child's strength we are adopting the best means of preventing serious complications.

The nutrition of the child must be carefully looked to. In the slighter attacks the child will usually be able to feed well in the intervals of the paroxysms, and it will only be necessary to see that its food is light, wholesome, and easy of digestion. But when the paroxysms of cough are frequent, and attended almost always by vomiting, to maintain the nutrition of the child may be difficult.

The food must, of course, be fluid, and it may be desirable to give it peptonised. A draught of peptonised milk with a few drops of brandy in it may be given immediately the vomiting attending the paroxysms is over; there will be a better chance of its being absorbed in the intervals between the attacks. If this method fails we must have recourse to rectal feeding—at any rate, as an auxiliary.

In protracted cases, and when the season is suitable, no measure answers better than change of air—change from the town to the country or to the seaside. In mild cases, and when there is not much bronchial catarrh, and in fine weather, out-of-door exercise may be permitted and encouraged. But on the occurrence of any rise of temperature the child should at once be kept in bed and carefully watched.

With regard to prophylaxis, the only effectual prevention of the spread of the disease is isolation. As some children are often well and active in the intervals between the paroxysms, and as out-of-door exercise is frequently permitted, to maintain effectual isolation becomes extremely difficult or impossible. In these circumstances it is best that delicate and susceptible members of the family should be kept away from the patient, by removal from home, if possible. The sputum should be received in a vessel containing some disinfecting fluid, and then poured into boiling water and buried; or it may be received on sawdust and burnt. Grown-up children with whooping cough should wear a respirator containing some volatile antiseptic. It must be borne in mind that a child is not considered free from infection until five weeks have elapsed from the onset of the characteristic cough, and at least two weeks from its disappearance; and then it must be understood that the patient and his clothes have been disinfected. It is most important not to overlook these conditions in advising *change of climate*, otherwise we may make ourselves responsible for the spread of the disease. The proper period of *quarantine* is 21 days after assumed exposure to infection, with the understanding that disinfection has been attended to at the commencement of isolation.

ADDITIONAL FORMULÆ FOR DIPHTHERIA AND WHOOPING COUGH.

Sulphur mixture for internal use in diphtheria.

Precipitated sulphur, 3 drms.
Chocolate powder, 2 drams.
Oil of cinnamon, 2 or 3 drops.
Glycerine to 6 oz.

One or two teaspoonfuls for a dose. (*Knaggs.*)

Perchloride of mercury mixture for internal use.

℞ Hydrargyri perchloridi, gr. ⅙.
Sodii chloridi } āā gr. j.
Pepsinæ }
Tincturæ aconiti, ♏x. ad ♏xv.
Aquæ destillatæ, ℥iv.

M. f. mist. A tablespoonful every hour. (*Robbe.*)

For internal use.

℞ Acidi salicylici, ʒj ad ʒij.
Gummi tragacanthæ, ℥j.
Syrupi simplicis } āā ℥ss.
Aquæ floris aurantii }
Aquæ destillatæ ad ℥viij.

M. f. mist. A tablespoonful every two hours (alternately with perchloride of iron, if necessary).

Local application.

℞ Acidi salicylici, gr. xx.
Spiritus vini rectificati, ʒjss.
Glycerini, ℥jss.
Infusi eucalypti ad ℥iv.

M. f. pigm. To be frequently applied with a brush. (*Jules Simon.*)

Ointment for nasal diphtheria.

℞ Sulphuris sublimati, ʒj.
Adipis ad ℥j.

To be applied as high as possible after irrigation with boric acid solution. (*Jules Simon.*)

Glycerole of carbolic acid and camphor for local application in diphtheria.

Shake together a mixture of
2 drams of carbolic acid,
8 drams of camphor,
10 drams of glycerine,
and place it in a bath of boiling water for ten minutes. Allow to cool. A white, viscid liquid separates and accumulates on the surface. This is the glycerole of phenol and camphor. It has a powerful destructive action on the virus of diphtheria.

It may be applied once or twice a day to the throat, after the false membrane has been removed as completely as possible with a plug of cotton-wool; at the same time free irrigations of the throat should be made every hour with carbolic or naphthol water.
(*Chantemesse and Widal.*)

Gargle of lactic acid.

℞ Acidi lactici, gr. cl.
Syrupi aurantii, ℥j.
Aquæ ad ℥viij.
M. f. gargar. (*Le Gendre.*)

Application of carbolic acid and camphor.

℞ Acidi carbolici, gr. lxxx.
Camphoræ, ʒv.
Olei olivæ, ℥j.
M. (*Soulez.*)

Naphthol camphor for local application.

℞ β-Naphthol, ʒj.
Camphor, ʒij.
M. (*Bouchard.*)

Belladonna and quinine powders for whooping cough.

℞ Pulveris radicis belladonnæ, gr. jss.
Quininæ sulphatis, gr. viij.
Sacchari albi, ʒss.
M. et divide in pulv. x. One three times a day.
(*Widerhofer.*)

Spray for whooping cough.

℞ Cocainæ hydrochloridi, gr. x. ad xv.
Potassii chloratis, gr. iij.
Aquæ ad ℥jss.
M. f. sol. To be sprayed into the throat twice a day.
(*Græffner.*)

Insufflation for same.

℞ Pulveris benzoini } āā gr.
Bismuthi salicylatis } lxxv.
Quininæ sulphatis, gr. xv.
M. f. pulv. For insufflation.
(*Moizard.*)

Another.

℞ Quininæ hydrochloridi, gr. x ad gr. xx.
Sodii bicarbonatis, gr. xx.
Pulv. acaciæ gummi, ʒiij.
M. f. pulv. A few grains to be insufflated into the throat twice or thrice daily.
(*Norman Bridge.*)

Liniment for the chest during convalescence.

℞ Olei eucalypti } āā
Linimenti camphoræ } ℥ij.
Olei cajuputi, ℥ss.
Olei menthæ piperitæ, ʒij.
M. f. linimentum. (*Whitla.*)

Chloral and bromide mixture.

℞ Chloral hydrate, gr. xv. ad xlv.
Potassii bromidi, gr. lxxv.
Syrupi aurantii, ʒiij.
Aquæ destillatæ, ℥ij.
M. f. mist. A teaspoonful every two hours. (*Widerhofer.*)

Benzoate of sodium mixture.

℞ Sodii benzoatis, gr. lxxv.
Syrupi aurantii, ℥j.
Aquæ ad ℥iv.
M. f. mist. A tablespoonful every hour. (*Letzerich.*)

Carbolic acid and iodine mixture for whooping cough.

℞ Acidi carbolici, gr. xv.
Spiritus vini rectificati, ♏xv.
Tincturæ iodi, ♏iij.
Tincturæ belladonnæ, ♏xlv.
Syrupi papaveris, ʒijss.
Aquæ menthæ piperitæ, ad ℥ij.
M. f. mist. A teaspoonful every two hours, between one and two years of age; half the quantity diluted with water for infants under a year. (*Rothe.*)

Mixture for whooping cough.

℞ Extracti cannabis indicæ, gr. xij.
Extracti belladonnæ, gr. iv.
Spiritus vini rectificati } āā
Glycerini } ʒjss.
Aquæ ad ℥iij.

M. f. mist. Half a teaspoonful to two teaspoonfuls for a dose, according to age, night and morning. (Not to be given to children under eight months.) (*Vetlesen.*)

Another.

℞ Extracti belladonnæ liquidi, ♏vj.
Potassii bromidi, gr. xlviii.
Glycerini, ℥iij.
Aquæ destillatæ ad ℥iv.

M. f. mist. Two teaspoonfuls every four hours. (*Penrose.*)

Mixture for whooping cough with profuse secretion.

℞ Extracti belladonnæ, gr. vj.
Extracti conii, gr. iii.
Acidi tannici, gr. v.
Infusi senegæ, ℥ij.
Aquæ fœniculi, ℥j.
Syrupi aurantii floris, ad ℥iv.

M. f. mist. Two teaspoonfuls every two hours. (*Bouchut.*)

Syrup for whooping cough.

℞ Extracti belladonnæ, gr. ij.
Syrupi papaveris } āā
Syrupi floris aurantii } ℥j.

M. f. syrup. A teaspoonful night and morning. (*Archambault.*)

CHAPTER III.

THE TREATMENT OF THE ERUPTIVE FEVERS—SMALL-POX—SCARLET FEVER—MEASLES—RÖTHELN—AND THE TREATMENT OF ERYSIPELAS.

SMALL-POX—Prophylactic Measures during an Outbreak—Quarantine—Isolation—Disinfection—Varioloid—*Indications for Treatment*, mainly Symptomatic, during Period of Incubation—Vaccination—Treatment of the Initial Stage—Of the Eruptive Stage—Of the Suppurative Stage—Of the Stage of Regression—Complications—Convalescence.

SCARLET FEVER—Prophylactic Measures—Tenacity of the Infection—Antiseptic Inunction of the Patient—Disinfection of the Throat—Treatment of Mild Cases—Diaphoretics—Aconite—Quinine—Antiseptic Washes for the Throat—Treatment of the Severe, Malignant Forms—Indications—Methods of reducing Hyperpyrexia—Stimulants—Complications—Their Treatment—Otitis Media—Glandular Enlargements—Nephritis.

MEASLES—Characters of the Disease—Symptoms—Varieties—Complications and Sequelæ—Treatment of Mild Forms—Diaphoretics, etc.—Treatment of more Severe Cases—Of Respiratory Complications—Of Nervous Symptoms—Epistaxis—RÖTHELN.

ERYSIPELAS—Nature of the Disease—Invasion by Streptococci—Etiology—Clinical Course and Characters—Tendency to Recurrence—*Treatment*—Prophylaxis—Local Measures—Mechanical Pressure—Protection from the Air—Ichthyol—Dusting Powders—Antiseptics—Internal Remedies—Iron—Quinine—Sodium Salicylate—Sedatives—Digitalis, etc., in Threatened Cardiac Failure.

Additional Formulæ.

SMALL-POX.

WE shall, in dealing with the treatment of this disease, first describe, as briefly as possible, those **prophylactic** measures which are needed when dealing with an actual outbreak of the malady.

On the occurrence of a case of small-pox in a family, all the members of the household should be revaccinated if they have not been recently vaccinated, and the patient should be removed to a small-pox hospital. Anyone who has been exposed to the infection should be quarantined for sixteen days from the date of exposure, and submitted to thorough disinfection at the commencement of that period. Twelve days may be roughly estimated as the *incubation* period of the disease. A suitable place for quarantine must be found, whenever there is an outbreak of the disease, and also fit accommodation in hospital for those attacked.

In this connection we must not fail to take account of the fact that the contagion of small-pox is *volatile*, and that the specific agent in the effluvia from the patient can mingle with the atmosphere around and so infect the air at a distance. This danger is naturally increased when many patients are crowded together and in advanced stages. What has been aptly termed the "striking distance" has in some instances proved considerable, varying with the force and direction of the wind. In an outbreak in Sheffield it was traced to a circular distance of 4,000 feet from the hospital, and a similar fact was established at Bradford.* The contagion has also great vitality, and will cling with great tenacity to articles of clothing, and especially to things of loose texture and rough surface.

In places where a small-pox hospital does not exist, **isolation** of the patient must be carried out in his own home, and in the following manner. Only those who have been recently vaccinated, or who have had small-pox, are suitable as nurses. A room on the upper floor is preferable both for ventilation and isolation. It should have an open fireplace, in which a fire should be kept burning. All carpets and hangings and unnecessary articles of furniture should be removed. A sheet wrung out in a strong solution of carbolic acid, or some equally efficacious disinfectant, should be suspended across the doorway. Chlorine gas, sufficiently diluted to be quite respirable, may be diffused through the apartment by putting plates or saucers in the corners of the room, each containing 10 or 20 grains of powdered potassium chlorate upon which half a dram of strong hydrochloric acid has been poured. The diffusion of this gas can easily be regulated and lessened, when it is too strong, by covering one or more of the saucers with a plate; or, if the odour of chlorine is objected to, pieces of blotting paper soaked in eucalyptus oil may be placed about the room instead; but it is not so efficacious as a disinfectant; or powdered camphor, or spirits of turpentine, may be sprinkled about the apartment. Formalin may also be used for the same purpose, a spray of a 1 or 2 per cent. solution.

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* Nothnagel's "Cyclopædia of Practical Medicine," art. "Variola," by Zimmermann, English translation, 1902.

It is not desirable that the unaffected members of the household should remove elsewhere, lest they should, perchance, become the foci of infection in other districts. They must rely on re-vaccination, isolation of the affected member or members, and thorough disinfection. The house and the room occupied by the patient should be kept freely, but cautiously, ventilated. An open fire is very useful for this purpose, and also for the immediate destruction by burning of certain infected substances. All the excretions, all the discharges, including those from the mouth and nose, should be received in vessels containing some disinfectant, such as corrosive sublimate, chloride of lime, or carbolic acid, and, when practicable, should be buried deep in the ground, and not thrown into sewers or waste-pipes. Handkerchiefs, towels, bedding and clothing, and everything that has come into contact with the patient, should be plunged into water containing chloride of zinc (two fluid ounces to the gallon), or carbolic acid (four fluid ounces to the gallon), and, after remaining there for some time, should be boiled for at least half-an-hour in plain water. Small articles, such as bits of cotton-wool, lint, sponges, as well as books, papers, etc., should be burnt as soon as used. All earthenware, glass, or metal vessels used in the room should be cleansed in boiling water before being taken out of the room. No domestic animal, nor any person, except the nurses, should be allowed to enter the room. The attendants should wear over-garments that can easily be cleansed and disinfected, and on leaving the patient they should take a bath with carbolic soap freely used, and wash the hair with a weak solution of corrosive sublimate. Nothing that has been in the infected atmosphere should be worn or carried away from the premises without first being disinfected. The medical attendant should also be careful not to remain longer than is absolutely necessary with the patient, and he should not make unnecessary detailed examinations. He should pass into another apartment to give his instructions. He should also take care that both his person and his clothing are thoroughly disinfected before visiting other patients. When prolonged examinations are needed an outer garment of mackintosh, fitting close round the neck and wrists, should be worn in the sick-room, and hung up immediately outside it.

The patient, when convalescent, must not be allowed to rejoin his family until every scab has disappeared and the skin lesions have all healed, and until he has had two or three antiseptic baths—sponging the body and hair with a 1 in 2,000 sublimate solution, and afterwards bathing in plain water, using carbolic soap freely. In this connection it is important to note the condition of the soles of the feet, where, owing to the thickness of the epidermis, the scabs linger longest. We may sometimes be able to hasten their removal by mechanically aiding the detachment of the hardened masses. The clothes he wears should be new or free from any trace of infection. In case of death, the body, which remains highly infective, must be washed with a strong chloride of lime or sublimate solution and enveloped in a sheet saturated with one of these, and then placed in a hermetically sealed lead coffin. Disinfection of the sick-room, after recovery or death, is very important. Small things of little value had best be burnt. Whatever will bear prolonged immersion in boiling water, or exposure to steam at, or over, a temperature of 212° F., may be purified by this means; or exposure to a dry heat of 230° F. for two hours will suffice. The apartment itself and the heavy furniture may be disinfected by sulphur dioxide. For this purpose the room should be made as air-tight as possible, and five pounds of sulphur to every 1,000 cubic feet of space burnt in it. The sulphur should be in shallow iron pots surrounded by water which is at the same time vaporised, the presence of moisture being essential to the action of the gas on pathogenic organisms. The room should be kept closed for twenty-four hours, then opened and thoroughly ventilated. Or the room may be disinfected with *formalin*, which is more convenient and as efficacious. This is also serviceable for the disinfection of clothes. All surfaces should be washed with disinfecting solution (sublimate 1 in 1,000, or carbolic 1 in 50), and afterwards the floor and woodwork scrubbed with soap and water. The ceiling and walls must be whitewashed; or, if papered, the paper should be soaked first with carbolic solution, and then scraped off and burnt; or the walls may be rubbed with slices of new bread. The room had also better be kept open to the air and unoccupied for some weeks. These are the chief measures to be attended to in order to prevent the spread of this disease.

Vaccination has certainly modified greatly the type of this disease even where it has not conferred immunity, and the form known as "*varioloid*" is commonly met with. The mildest cases of this form really require no treatment beyond hygienic measures. The severer forms, however, may approach very closely in characters those of the unmodified disease, and must be, of course, treated in the same manner, and as in certain places the so-called "conscientious objectors" are numerous, in any extensive outbreak of this disease a considerable number of severe and fatal cases occur. The present epidemic in London (1902) has been fatal to a number of vaccinated as well as unvaccinated patients, and the necessity for *re-vaccination* has been amply demonstrated.

It is somewhat remarkable that in this, the type of a contagious disease, the infective agent has not yet been identified and isolated, nor have we any medicinal agents by which its activities can be neutralised or destroyed. It is no doubt parasitic, and its entrance into the body is most probably by inhalation through the mouth and nose. The **treatment,** therefore (apart from prophylaxis), is symptomatic, and the indications are to maintain the strength of the patient, and to impose such favourable modifications on the course and symptoms of the disease as may be within the scope and power of the means at our disposal.

With regard to *treatment* during the period of **incubation,** very conflicting opinions have existed as to whether vaccination, performed at any time during this period, can partially or completely protect the patient from the disease, or favourably modify its course. W. H. Welch, of Philadelphia, and H. Immermann, of Basle, recent authorities on this subject, maintain that it certainly can.* Welch states that he has seen many cases of small-pox, which have been very greatly modified by vaccination, performed during the period of incubation, and some instances in which it has been absolutely prevented. For complete protection he found it necessary that vaccination should be performed "immediately after the reception of the contagium; but, if made at a somewhat later date, a modifying effect may be obtained. No part of the incubation period should be considered too late to make use of this remedy." He thinks that vaccinia only begins to exert prophylactic power when the areola commences to form around the vesicle.

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* Dr. W. H. Welch, Physician to the Municipal Hospital for Contagious and Infectious Diseases, Philadelphia: Hare's "System of Practical Therapeutics" (second edition), vol. ii., p. 105; and Immermann, in Nothnagel's "Cyclopædia of Practical Medicine," art. "Vaccination."

"If this stage of the vesicle be reached before the patient shows any symptom of small-pox, the disease may be entirely prevented; if not reached until after the febrile symptoms appear, but before the eruption occurs, it may modify the attack . . . if vaccination be practised on the first or second day after the reception of the infection, the protection may be perfect; and if employed between this date and the fifth day, it may be partial." He also gives reasons for concluding that humanised virus is much more protective than animal lymph, and he prefers "eight-day lymph taken directly from a typical vaccine vesicle on the arm of an infant." He also insists that a considerable number of insertions should be made in order to lessen the risk of failure, and to hasten the attainment of the prophylactic stage. He objects to bovine lymph because of the relative slowness with which it reaches the areola stage. Of 194 cases in which he performed vaccination after infection, 38 enjoyed complete protection, 16 were almost completely protected, 31 were protected to a well-marked degree, 30 were partially protected, and 79 were unprotected.

In the **initial** stage, the febrile stage that precedes the appearance of the eruption by about three days, the patient should be kept in bed in a room the temperature of which should be from 65° to 70° F., with a space of not less than 2,000 cubic feet, and means of free ventilation without exposing the patient to chilling draughts. Some saline diaphoretic should be given, and preferably in effervescent form, such as

℞ Ammonii carbonatis	gr. v.
Potassii bicarbonatis	gr. xv.
Liquoris ammonii acetatis	ʒij.
Syrupi aurantii	ʒj.
Aquæ	ad ℥jss.

Misce, fiat haustus. To be taken every four hours in effervescence with 15 grains of citric acid. Half this dose may be given to children.

In this and subsequent stages, the depressing anti-pyretic drugs should be avoided, as they are more likely to do harm than good.

If there should be sickness, which is not rare with children, fragments of ice with a teaspoonful or two of lime water may be given frequently. A high temperature, with a hot and dry skin, may be treated by sponging with tepid water; and severe headache, by the application to the head of an ice-bag or lint dipped in iced water.

Severe *pain in the back*, together with restlessness, *insomnia*, and other nervous symptoms, may appear in this stage. In children delirium and convulsions may occur. The best remedy for these symptoms is a prolonged lukewarm, full length bath, followed by a dose of Dover's powder (1 to 5 grains for a child, according to age, and 12 grains for an adult); or a combination of chloral and sodium bromide may be given for the nervous irritation and sleeplessness. Should it be difficult to give medicines by the stomach on account of sickness, a morphine suppository may be used; or a small enema of bromide and chloral may be given. Mustard plasters to the back or elsewhere are obviously undesirable, and for the relief of the backache other measures have been suggested. A mixture of chloroform liniment and soap liniment may be rubbed into the back; others recommend dry-cupping, or the application of an indiarubber hot-water bag, and others a few small doses of antipyrin. Cooling acidulated drinks may be freely permitted. The food should be light and fluid, such as milk and light animal broths. A little tea may also be allowed to adults. The bowels must be kept relieved by gentle aperients. If signs of cardiac weakness should appear at this early stage, which is rare, caffeine may be given hypodermically.

The treatment of the **eruptive** stage must next be considered. This stage usually lasts seven or eight days, but in the modified varioloid it may not last so long. Various *antiseptics* have been used in this stage, both externally and internally, with the hope of modifying the severity of the eruption and preventing pitting, but it cannot be said that any marked success has attended their use. Some benefit has been claimed to follow the use of sulphur, a drug which is, in part, eliminated by the skin, and may therefore exert a local action. The following mixture has been prescribed for children :—

℞	Sulphuris loti	ʒijss.
	Syrupi simplicis	℥j.
	Glycerini	℥jss.
	Aquæ floris aurantii	ad ℥v.

Misce, fiat mistura. A teaspoonful every hour.

Moderate doses of quinine, perseveringly given, dissolved in lemon-juice and water, we should strongly advocate. Bianchi has employed antiseptics locally with good results. He uses a boric-acid bath with antiseptic soap every four hours. After the bath an iodoform and vaseline ointment is applied (1 to 5 per cent.). The pustules, where possible, are opened with an aseptic needle, and the patient is wrapped in aseptic linen which is frequently changed. The following spray has also been used :—

℞	Hydrargyri perchloridi Acidi tartarici	āā gr. xv.
	Spiritus vini rectificati	ʒjss.
	Ætheris	ad ℥iij.

Misce. This is applied with a hand-spray twice or three times a day. *Great caution must be observed in using so poisonous an application.*

Immermann * is inclined to think that none of these measures affords greater relief than the plan advocated by Von Hebra for quieting the patient and alleviating the discomfort of the eruption by the frequent repeated application of moist cold, in the form of ice-water compresses or moist cold packs. As the eruption advances towards suppuration the water may be used warmer and the compresses may be covered with a water-proof protective covering. Later on, when suppuration has occurred, some disinfectant may be added to the water, such as carbolic acid or thymol or Condy's fluid. The head and face and hands and feet may still have the ice-cold application, which exerts an anti-pyretic influence.

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* Nothnagel's "Cyclopædia of Practical Medicine," English translation, art. "Variola," 1902.

It has been stated that if the **ultra-violet rays** are intercepted by means of tightly-drawn red curtains, or red window-panes, in the patient's room, the injurious effect of the sunlight on the skin will be avoided, and patients are said to have escaped the suppurative stage and avoided scarring when kept in a room the windows of which were covered with thick red woollen curtains. This treatment with red light has recently been tried in Lyons with negative results. Some of the patients became very excited and begged to be placed in ordinary light; indeed, the red light proved very trying both to patients and attendants.

The fever usually lessens after the appearance of the eruption, but increases again with the onset of the suppurative period. If the eruption is tardy in its appearance, warm stimulating drinks should be given to promote its full development. The condition of the mouth and throat, which is often very distressing, requires some attention. Mouth-washes of borax and boric acid, or of potassium chlorate, to which a little tincture of myrrh is added, are very comforting, and they may be used warm. Some prefer weak solutions of ferric perchloride. In young children these solutions may be sprayed into the mouth and throat, or the nurse may wash the mouth with her finger covered with lint dipped in them. Ice-cold compresses round the neck are also recommended. The burning and itching of the skin may be relieved by the application of ice-cold water in the manner just described; some use a mixture of olive oil and lime water in equal parts, perfumed with lavender water; this should be brushed freely over the skin. Ointments of vaseline, with thymol, or eucalyptol, or carbolic acid, are also serviceable, and are of advantage in lessening the unpleasant odour of the disease. Some use antiseptic dusting powders, as boric acid, carbolised zinc powder, "dermatol," and others. Some apply to the face a light *mask* of lint, well soaked in a mixture of iced-water and glycerine (a dram to the ounce), and cover it with oiled silk.

Ichthyol ointment (1 part ichthyol, 2 parts lanolin, and 6 parts lard) has been warmly commended, applied three times a day, as soon as the papules are visible. It is said to favourably modify the course of the eruption, lessen the fever, and render the whole course of the disease milder. Much pain sometimes attends the development of the eruption in the thick skin of the hands and feet; this is best relieved by hot fomentations.

Towards the latter part of this stage troublesome symptoms of nervous excitement are apt to appear, such as great restlessness, insomnia, and violent delirium. In the robust this condition may sometimes be relieved by a brisk purge and an ice-bag to the head. In some cases a combination of tartar emetic and morphine ($\frac{1}{8}$ to $\frac{1}{3}$ grain of each) has been found of great service in quieting delirium and inducing sleep; or full doses of chloral and bromide, largely diluted, may be given by the stomach, or, if necessary, by the rectum. Certain cases are so violent as to need physical restraint.

The food during this stage must be nutritious and easily digested. Animal broths, milk, bread and milk, whipped eggs, are the most suitable. For the *throat* nothing is better than plain water flavoured with a little lemon-juice or raspberry vinegar.

The form known as *hæmorrhagic* or *malignant* small-pox affords little scope for treatment, as it is almost inevitably and rapidly fatal. Quinine, ergot, perchloride of iron, and even transfusion, have been tried, but not with any curative result.

By the stage of **suppuration** is meant the period when the eruption becomes mature and the papules and vesicles have developed into pustules. It usually occupies from the eighth to the twelfth day of the eruption, and it is accompanied with the so-called secondary or suppurative fever. This is the most serious, painful, and fatal stage. Often the mouth, throat, and larynx become dangerously involved, swallowing becomes almost impossible, and respiration is greatly impeded. Everything that is possible must now be done to maintain the strength, lessen the fever, relieve the throat symptoms, and disinfect the surface.

In **confluent** cases the temperature at this stage may reach 105° or 106° F. Quinine is one of the best agents for allaying the fever as well as supporting the strength. The dose necessary is not more than 2 or 3 grains, but it must be given in solution, and best in effervescence with potassium citrate, and it should be given every two, three, or four hours, according to the severity of the fever. Immermann prefers a strong decoction of *cinchona bark*, and this, combined with full doses of alcohol, he considers of undoubted value during the suppurative fever. He gives 2 to 4 ounces of cognac in twenty-four hours, and he likes the brandy and egg mixture of the B.P. as a vehicle. The decoction of cinchona bark he gives in combination with dilute hydrochloric acid and spiritus ætheris nitrosi. To allay the high fever of this stage and to quiet the cerebral excitement he speaks very confidently of the value of *lactophenin* (this differs from phenacetin in containing a molecule of lactic acid in place of acetic); he gives it in doses of 7 grains once or twice in the evening. He found it exerted an "extremely favourable" influence both on the fever and the general condition.* Small-pox patients do not bear cold baths or cold affusion well.

The rupture of the pustules by the scratching of the patient, as they itch fearfully, covers the surface with a foul, decomposing, fœtid exudation. Such *antiseptic* washes and sprays as we have already mentioned must now be used freely. Some prefer oily appliances, such as the olive oil and lime-water lotion, to which some carbolic acid or eucalyptol may be added (10 to 20 drops to the ounce). Dujardin-Beaumetz strongly recommended an ointment composed of 4 parts of sodium salicylate to 100 parts of cold cream. This is freely applied to the face and other parts affected with the eruption, and these are then dusted over with a powder composed of 6 parts of sodium salicylate and 100 of talc. Welch suggests the trial of a dusting powder composed of 15 to 20 parts of aristol to 100 parts of talc. This authority protests against the use of most of the expedients that have been suggested for the prevention of pitting and scarring, and quotes with approval Gregory's statement that "the masks and ointments formerly in use for that purpose, and so highly vaunted, are, in reality, more hurtful than beneficial. The application of a little cold cream to the hardened scabs is all that can be recommended." We would suggest as a very suitable application to the face during this and the preceding stages an ointment composed of camphor 2 parts, menthol 3 parts, and vaseline 20 parts.

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* Nothnagel's "Cyclopædia of Practical Medicine," English translation, art. "Variola," 1902.

At this period of the disease in severe confluent cases the condition of the mouth and throat is such as to cause much anxiety. The mucous membrane of these cavities is often covered with what looks like a diphtheritic membrane, and this may extend into the posterior nares and into the larynx, causing dysphagia and much fœtor of the breath. The disinfecting washes and sprays recommended in the treatment of diphtheria should now be employed. Perhaps the best is a solution of chlorine made by pouring 40 minims of strong hydrochloric acid on 20 grains of powdered potassium chlorate in a 12-ounce bottle, corking the bottle and allowing the liberated chlorine to collect in it, and then filling the bottle, little by little, with water, and shaking at each addition; a very effective disinfecting lotion is thus obtained, a few drams of glycerine should be mixed with it. Or a spray may be used freely to the mouth and nostrils composed of 1 ounce each of glycerine of borax and glycerine of carbolic acid to 12 ounces of rose water.

The patient should be given iced barley water, with a little glycerine in it, to sip frequently. Œdema of the glottis may threaten suffocation and necessitate tracheotomy, which, it is needless to say, would be performed under very unfavourable conditions. The state of the eyes at this period also requires attention; the lids are usually greatly swollen, and pus exudes from between the closed lids. They should be freely bathed and cleansed with warm boric acid solution.

The patient's strength during this trying and exhausting period must be maintained by the free exhibition of stimulants and nutritious fluid food. The egg-and-brandy mixture of the B.P. should be given freely and frequently. We have already dwelt on the value of quinine in these cases. Digitalis may be needed in threatened heart failure, or caffeine, or hypodermic injections of ether. It is better to keep the bowels unloaded by means of enemata than to give purgatives by the mouth in this stage.

The stage of **regression**, or drying up and disappearance of the eruption and of the swelling and redness of the skin, usually begins about the eleventh to the thirteenth day. The patient will still require supporting food and stimulants and tonics, of which quinine, with perchloride of iron and strychnine, will be the best. Cooling and soothing antiseptic washes, or ointments, are still necessary to disinfect the decomposing *débris* and exudation which even now cover the skin, and to allay the itching.

The numerous **complications** of small-pox have to be treated on the same general principles as when they occur under other conditions, such as abscesses, erysipelas, gangrene, corneal ulcer, pneumonia, empyema, etc. Corneal ulcer is a very serious complication, and may lead to blindness, and even destruction of the eye-ball; it is not due, as has been supposed, to the formation of a variolous pustule on the cornea, which appears to be immune from the small-pox eruption. Welch has observed it begin with "a little pain and slight redness in a certain part of the eye, usually at the margin of the cornea, and very soon an ulcer is formed. The ulcerative process is often very rapid—so rapid, indeed, as to destroy the entire cornea within forty-eight hours." In order to prevent this deplorable complication the eyes must be kept scrupulously clean; a saturated solution of boric acid in rose water should be dropped into the eyes twice daily. As soon as any sign of ulceration appears the spot should be carefully touched with a finely pointed stick of nitrate of silver; atropine should then be dropped into the eye, and cold compresses kept applied. Opium is often useful; it relieves the pain in the eye, and appears to have a good effect in modifying the ulcerative process.

Tonics, such as quinine and iron, and stimulants, of which good beer or porter is the best, and a nutritious dietary, are needed during the convalescent period; the frequent occurrence of boils during this stage may call for the use of arsenic.

Complete shedding of the crusts is hastened by the free application of glycerine to the skin and the daily use of warm baths.

SCARLET FEVER.

As in the case of small-pox, so with regard to scarlet fever, we shall first refer briefly to the necessary **prophylactic** measures which must be adopted in order to prevent the extension of the disease, when we find ourselves in the presence of an outbreak. Much that has been said with regard to the prevention of the spread of small-pox necessarily applies also to the case of scarlet fever. The specific infective micro-organism of scarlet fever has not yet been adequately demonstrated. Klein has found a streptococcus in the blood and in the throat which he regards as distinctive; but others think it dependent on the *septic* element doubtless present in most grave attacks. Osler mentions that Class of Chicago has found a *diplococcus* in the blood, throat, and desquamated cuticle in 300 successive cases, which proved pathogenic to mice, swine, and guinea-pigs. The streptococcus is undoubtedly an active agent in the throat and ear affections.

Scarlet fever is not only contagious during the period of desquamation, it would appear to be contagious from the first day of its occurrence up to the time when desquamation has entirely ceased; and some believe that even after this period, if there should be a discharge from the ear, owing to otitis media, or from the nose from rhinorrhœa, such discharges may prove infectious unless these passages are kept disinfected by antiseptic injections. The period of isolation after an attack should not be less than six weeks from the first appearance of the rash, supposing the child to be then quite well, the desquamation to have entirely ceased, as well as all discharges from the throat, nose, and ears. The average incubation period is three days, the shortest is two hours, and the longest six days. As a measure of safety, the quarantine period, after exposure to infection, is ten days.

There is this peculiarity about the poison of scarlet fever, that its tenacity is remarkable, and that it adheres to persons and things with great persistence, and is therefore readily conveyed by such means from place to place. Hence it is of the greatest importance that all books, pictures, toys, etc., used by scarlatinous patients should be burnt, and not allowed to pass into the possession or use of other children. Many months may elapse and yet the infection remains in such objects active and virulent. Epidemics have often been traced to infected milk, but never yet to bad drainage or contaminated water supply. It has been said that the method of disinfecting an apartment by burning sulphur in it, as described in the section on small-pox, is useless, because if, immediately afterwards, the *dust* in the apartment is collected, numerous micro-organisms may be obtained from it. But this is rather a foolish criticism; antiseptic *vapours* are intended to act as *aërial* disinfectants, and not necessarily, at the same time, as destroyers of microbes in deposits of dust. Such deposits must be dealt with in a different manner. Aërial disinfection is not supposed to dispense with the necessity for other methods which are needed to disinfect dust-containing objects, or dust deposits.

We have, in a hospital, used chlorine vapour with absolute success in disinfecting a ward of the infection of scarlet fever, but we have never thought of leaving dust deposits, or articles holding dust, to take care of themselves; they must be dealt with differently. All dust deposits should be gathered up and cleared away by sponges wetted in strong antiseptic solutions, and these should be subsequently burnt, or soaked in boiling water, or exposed to a dry heat of 230° to 240° F., and all other contaminated articles must be treated as described in the section on small-pox.

Isolation of the patient, **disinfection** of his person, and of those about him, and of the air and the necessary objects in the apartment, is the practice that must be carried out in order to prevent the spread of the disease. In the preceding section on small-pox we have described how this may be done. During the whole course of the case the following antiseptic fluid has been recommended to be vaporised into the apartment from the surface of hot water kept simmering over a gas or oil-stove:—

℞ Acidi carbolici	āā ℥j.
Olei eucalypti	
Spiritus terebinthinæ	ad ℥viij.

Misce. Two tablespoonfuls to be added to a quart of hot water.

As another precaution and as a comforting application, the whole surface of the body of the patient should be sponged once or twice daily with tepid water and subsequently anointed with the following oil :—

℞ Acidi carbolici	ʒj.
Olei eucalypti	ʒij.
Olei olivæ	ad ℥viij.

Misce.

As there is almost invariably some local manifestation of this disease in the throat, where not infrequently patches of false membrane appear, as in diphtheria (which, it must be remembered, occasionally complicates this disease), disinfection of the throat and mouth is also important. Nothing is more efficacious for this purpose, or more beneficial to the disease itself, than the chlorine mixture made according to the formula at the end of this chapter (p. 655). This should be used freely as a wash for the mouth and throat, and some of it should be swallowed. Another way of applying it to young children is by means of a rubber enema bottle holding 4 or 5 ounces, with which the nurse should irrigate freely the fauces. A weak solution of formalin (½ per cent.) has been suggested instead of this, but it is not so good. A borax and boric-acid wash, with a little tincture of myrrh, is also useful for the same purpose, and preferable for cleansing the nasal passages :—

℞ Acidi borici	ʒj.
Glycerini boracis	℥j.
Tincturæ myrrhæ	ʒij.
Aquæ	ad ℥xij.

Misce, fiat gargarisma.

The physician in attendance should remember that great infectivity attaches to the discharges from the throat, nose, and ears, and that the desquamated cuticle is much more infective during the *early* part of convalescence than later on, and he should be particularly careful that none of the infective virus attaches itself to his clothes or to his person. The precautions necessary in each case, from this point of view, may best be left to the judgment and discretion of the practitioner himself. Non-attendance on midwifery cases while looking after scarlet fever patients is a precautionary measure now universally adopted. We have already given instructions (page 617) for the disinfection of rooms that have been occupied by such cases. The preceding measures are all directed to the limitation and weakening of the infection.

The **indications** for remedial **treatment** in scarlet fever, as in small-pox, are almost wholly symptomatic. In the *mildest cases* little is needed in the way of drug treatment. The patient should be in a well-ventilated bedroom at a temperature of about 60° F., but at the same time he should be most carefully protected from cold currents of air and possible chill. He should remain in bed during the active period of the disease—*i.e.* in normal and favourable cases about ten or twelve days—and he should keep his room during the whole time of desquamation, which may last from four to six weeks. In winter or in cold seasons it will be advisable for him to keep to his room and the house even longer.

We must distinguish, in considering the appropriate treatment of cases of scarlet fever, between the *mild* forms and the *severe* and malignant forms. Although scarlet fever is the most fatal of the infectious fevers, yet different epidemics differ very greatly in their severity. In some the cases assume a very mild form and run generally a favourable course; but even in the mildest cases we can never be sure that some serious complication may not arise. The same careful nursing and medical observation must be given to a mild as to a severe form of this fever. During the period of invasion, which is brief (the eruption generally appears on the second day), after an aperient dose, a diaphoretic saline should be given, and if the child is strong and robust, with a rapid, hard pulse and a high temperature, a small dose of aconite may be added. The following mixture will be suitable:—

℞ Liquoris ammonii acetatis	℥jss.
Potassii chloratis	ʒj.
Tincturæ aconiti	♏xij.
Syrupi limonis	℥ss.
Aquæ	ad ℥vj.

Misce, fiat mistura. One to three teaspoonfuls every four or five hours, according to age.

This mixture will tend to promote the development of the rash, and will at the same time allay the feverishness and heat. The aconite should be omitted after the first forty-eight hours, but it has an exceedingly tranquillising effect, in the early stage, in the type of child indicated. If there is a thickly-furred tongue and a tendency to vomiting, an effervescing saline with an excess of alkali should be given, and a grain or two of calomel with sugar may be thrown on the tongue; or an aperient dose of Gregory's powder with a grain or two of grey powder may be given. It is well at the outset of all febrile maladies to sweep away any fæcal collections there may be in the intestines.

If the temperature does not rise above 103°, and no very troublesome throat affection manifests itself, little else need be done during the eruptive stage. The child should be clothed in a light flannel night-dress and given fluid food, such as thin broths, gruel, and especially milk and milk and water, freely. Some fresh fruit may also be permitted, such as oranges and grapes. When the temperature falls, and has been normal for a week or so, the patient may be given a more solid diet, such as milk puddings, eggs, light fish boiled, and meat jellies; and, at the same time, a mixture of quinine, perchloride of iron, and potassium chlorate as a tonic to protect him, if possible, from any adverse complication and to stave off anæmia. We must remember that potassium chlorate in large doses is a renal irritant, and we should therefore only use small ones. A grain for every year of the child's age, up to 5 grains, is a safe rule. The following mixture may be prescribed:—

℞ Quininæ sulphatis	gr. xxiv.
Potassii chloratis	gr. xlviij.
Tincturæ ferri perchloridi	♏cx.
Succi limonis	℥ss.
Syrupi	℥j.
Aquæ	ad ℥vj.

Misce, fiat mistura. One to three teaspoonfuls, according to the age of the child, three or four times a day.

Oily applications to the skin are particularly grateful, and are needed to relieve the dryness and itching which accompany the rash. Vaseline is used by some, or we may use the antiseptic oil already mentioned, or the itching may be allayed by bathing the whole surface with a weak solution of carbolic acid (1 or 2 per cent.) in camphor water, or camphorated oil may be used. Eucalyptus oil as a disinfecting application to the skin has been greatly extolled, and the ointment of eucalyptus of the B.P. (or the oil prescribed at page 630) may be used to anoint the surface throughout the whole course of the disease and until desquamation is over.

The presence of a streptococcus in the secretions on the fauces in scarlet fever is an indication for the use of antiseptic washes and applications to the throat in all forms and stages of this disease, and we may, by so doing, be enabled to check the tendency to the extension of the local inflammation, from the throat along the Eustachian tube, to the middle ear, as well as the infection of the cervical glands. Antiseptic sprays and washes, or gargles for those who are able to gargle, should be frequently used, and formulæ for these will be found at the end of the chapter.

In the next place we must consider the treatment appropriate to the severe and malignant forms. The **indications** now are: (1) to support the strength of the patient, (2) to deal efficiently with the local manifestation in the throat, and (3) to prevent, if we can, complications and sequelæ.

The condition which threatens to exhaust the patient, probably more than any other, is the occurrence and maintenance of a high temperature, and when the temperature is very high, and remains so, we must do our best to reduce it. The safest and best way of reducing temperature, although it will not always succeed, is to give quinine frequently, either in solution, in the chlorine mixture we have already referred to, or in effervescence, as in the following prescriptions. In either manner we should give from ½ to 3 grains, according to the age of the patient and the severity of the case, every two or three hours :—

℞ Sodii bicarbonatis	ʒj.
Potassii bicarbonatis	ʒjss.
Potassii chloratis	gr. xij ad xxxvj.
Aquæ	ad ℥xij.

Misce, fiat mistura alkalina.

℞ Quininæ sulphatis	gr. xxiv ad xxxvj.
Acidi citrici	ʒjss.
Syrupi limonis	℥j.
Aquæ chloroformi	ad ℥xij.

Misce, fiat mistura acida. One or two tablespoonfuls of each mixture in effervescence every two or three hours. The larger dose is for adults. Very young children may take doses of a dessertspoonful.

Quinine given in either of these ways * will be found in most cases to exert a remarkable effect in moderating the high temperature, while we run no risk of producing any depressing effect on the patient, or of determining renal irritation or congestion.

There are, however, other means of reducing temperature in these cases to which it is necessary we should allude. When the high temperature is accompanied by delirium and signs of nervous exhaustion, the cold pack may be needful, but scarlet-fever patients, for the most part, bear the *general* application of cold badly. The *local* application of cold, however, to the *head* and *neck* is often very efficacious in lowering the temperature, while it does not depress the patient. The application of an ice-bag to the head, or of pieces of lint or linen soaked in ice-cold water with which a little vinegar and eau-de-cologne have been mixed, is most refreshing; and at the same time a broad strip of lint, or soft linen, soaked in the same iced water, should be wrapped round the neck and throat and frequently renewed. The temperature may often be reduced by this means if it is perseveringly applied. In a vigorous patient the limbs may also, from time to time, be lightly and rapidly sponged with this cold lotion. The more frequently this is done, the greater will be the effect on the temperature. In cases with feebleness of circulation and general depression, cold must not be applied to the extremities, but rather tepid or even *hot* water, combined with stroking or friction in the direction of the venous blood-current. Sucking fragments of ice or sipping iced lemonade has also a cooling effect, and still more cooling is an ice-cold enema which may be composed of a few ounces of peptonised milk.

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* The antipyretic effect of quinine is much greater, when given in this combination, than when given alone in the solid form. The chloroform water in the acid mixture prevents changes in it which are apt to occur when kept.

We cannot recommend the employment of the various antipyretic drugs that have been so widely used in the treatment of febrile maladies; there is too great risk of undue depression attending their use. Certainly sodium salicylate, antifebrin, antipyrin, and similar depressors of temperature should be avoided. We have, however, seen good results follow the frequent exhibition of small doses of *phenacetin* in combination with quinine. The dose of phenacetin should not be more than ¼ to 1 grain for children between two and ten years of age. This dose may be given every hour or two, and its effect observed.

In case of the occurrence of delirium and muscular twitchings or convulsions, a few doses of sodium bromide should be given, in quick succession, until these manifestations of irritation of the nervous centres are quieted.

Alcoholic and other stimulants will be needed in this as in other acute diseases, when symptoms of exhaustion and threatened cardiac failure make their appearance. An ether and ammonia mixture containing from 5 to 20 minims each of spirits of ether and of aromatic spirits of ammonia in strong camphor water may be given every hour; and camphor has been injected hypodermically, on the recommendation of Henoch, dissolved in rectified spirits (1 in 5). Of alcoholic stimulants, whisky, brandy, and champagne are the best. A tablespoonful of champagne, with one of iced water, every hour will be most grateful when there is much thirst and a dry, parched mouth; but in cases bordering on collapse, brandy or whisky in one- or two-teaspoonful doses, given in hot milk, is better. In cases where food cannot be given by the mouth on account of difficulty in swallowing, rectal feeding must be adopted for a time.

The period of convalescence, in uncomplicated cases, will require careful watching and protection from chill. Light, nourishing food, and tonics, of which quinine and iron are the best, will also be needed. Jaccoud thinks that the restriction of the food to milk is a preventive of nephritis.

The treatment necessitated by the occurrence of certain **complications** and **sequelæ** must be very briefly noticed.

There can be little doubt that the glandular, visceral, arthritic, and other complications of this disease are caused by absorption of the infective virus from the throat and pharynx and adjacent parts, and that the early and thorough application of local antiseptic measures offers the most trustworthy means of protecting the constitution from the consequences of this secondary infection. It is desirable, therefore, from the first appearance of symptoms of this disease, to frequently irrigate or spray the throat and nasal passages with suitable antiseptic fluids, and this may easily be done with one of the "hand-atomisers" now so largely used. One of the best fluids for this purpose is that to which we have formerly called attention—viz. a mixture of 1 dram of glycerine of carbolic acid and 10 grains of sodium bicarbonate to an ounce of warm water. Some prefer a mixture of 1 part of peroxide of hydrogen to 3 or 4 of water. Other formulæ will be found at the end of the chapter. The following has been found particularly suitable for nasal irrigation:—

℞ Acidi borici	ʒj.
Boracis	ʒij.
Aquæ puræ	O j.

Misce, fiat lotio. To be used warm.

The evils resulting from the occurrence of **otitis media,** as a complication or sequel of scarlet fever, may sometimes be prevented by careful treatment at the onset of the symptoms. As soon as pain in the ear is complained of, a few drops of a mixture of equal parts of laudanum and glycerine, or of a 5 per cent. solution of cocaine and glycerine, may be dropped in, and a hot bran poultice at the same time applied. But the most effectual means of relieving the pain, which we have found succeed when other measures have failed, is to heat a large wine-glass by pouring hot water into it, and then to pour 10 to 20 minims of chloroform upon a small piece of cotton-wool in the bottom of the glass and hold the glass, closely applied, over the affected ear. The vapour of the chloroform enters the ear and acts both as an antiseptic and as an anæsthetic. Subsequently the chloroform may be mixed with tincture of iodine, and mixed chloroform and iodine vapours are thus conveyed into the ear, while iodine paint should at the same time be applied behind and in front of the ear. Some think highly of the early application of a leech to the posterior surface of the tragus. But we prefer the method we have just described to every other. Puncture of the tympanum has been warmly advocated if the pain and inflammation continue, and if, on examination of the ear by the speculum, the tympanum is found to be tense and bulging. This operation may save the membrane from ulceration and the patient from chronic suppurative otitis. After the puncture the antiseptic vapours of chloroform and iodine should be allowed to pass into the ear every few hours, as detailed above, and the throat should be kept diligently cleansed by antiseptic washes. It may be necessary in some cases, by means of Politzer's bag, to clear out pent-up secretion from the tympanic cavity. Should, however, ulceration of the tympanum have occurred and a putrid otorrhœa have been established, the ear must be gently syringed with a warm antiseptic lotion two or three times a day (a saturated solution of boric acid in water is as good as any), and afterwards a little fine powder of boric acid insufflated; or the iodine vapour and paint should be applied as already indicated. The external meatus may be lightly filled with iodised or menthol cotton-wool, or cotton-wool that has been dipped in a solution of zinc sulphate and rose water (5 grains to the ounce).

The **glandular** enlargements in the neck, which often follow scarlet fever, may frequently be dispersed quickly by steady and continued inunction of iodide of lead ointment; ichthyol ointment has been found useful for the same purpose. At the same time we should give cod-liver oil and syrup of the iodide of iron internally.

Albuminuria from nephritis (we do not refer to merely febrile albuminuria) occurs with very varying frequency in different epidemics of this disease. It is one of the most serious of the sequelæ of scarlet fever. Some of the cases of scarlatinal nephritis are no doubt induced by incautious exposure to chill during convalescence, and this will account for the number of those cases that occur after quite mild attacks of the disease. But in other cases it would seem more consistent with observed facts to refer the nephritis to the irritation of the kidneys by the specific virus of the disease.

The measures that should be taken to prevent the absorption of the infective agent, from the throat and adjacent mucous surfaces, have been fully dwelt upon, and here we must call attention chiefly to the importance of protecting the patient, during the period of convalescence and desquamation, from the possibility of chill. The child should be kept in a warm apartment during the three or four weeks that peeling is going on, and the urine should be frequently examined in order to detect the earliest sign of approaching nephritis. Should nephritis supervene, it must be dealt with according to the principles we have already laid down in treating of that disease.

MEASLES.

Measles, like scarlet fever, is a highly contagious disease, and probably depends on the invasion of the body by a specific microbe; but this has not yet been discovered and cultivated. The contagion of measles, although not nearly so tenacious as that of scarlet fever, is far more diffusible; so that when it appears in a family its spread is more general. It is also infective from a very early stage, before any characteristic symptoms are manifested, and therefore before the nature of the illness is understood; hence it may be conveyed before the need of isolation has been recognised, and hence, no doubt, it is that school attendance is a most serious factor in the spread of the disease. The contagion appears to be in the breath, in the secretions from the disordered mucous membranes, and in the eruption on the skin, especially during desquamation. It is regarded as infective for a fortnight after the appearance of the rash and as long as any desquamation or catarrhal symptoms exist. The contagion is said to be rapidly dissipated by ventilation, but we have known it remain in a room in a college, and affect two sets of adult residents, after an interval of six months. This disease attacks adults exposed to the infection, as well as children, and of all the specific eruptive fevers it is the one most prone to recurrence, and the least protective against subsequent attacks. It is very prone to follow whooping-cough, or to be followed by it. Indeed, any pre-existing catarrhal condition of the air-passages favours an attack. No disturbance of health is noticeable during the incubation period, which varies within very narrow limits—viz. from ten to thirteen days. The necessary period of quarantine, after exposure to infection, and after disinfection, is estimated at sixteen days.

Little **treatment,** beyond warmth and protection from unfavourable influences, is needed in ordinary cases of measles; but the tendency to complications and to sequelæ of a serious nature, especially affecting the respiratory organs, renders it necessary to observe great care and caution in the management of cases of this disease.

The malady commences with a somewhat sudden rise of temperature, which may reach nearly 104° on the first day. It then falls again a degree or two, until the appearance of the eruption on the fourth day, when it again rises. Characteristic **catarrhal** symptoms appear at the onset. There is often intense **coryza,** profuse running from the nose and eyes, the conjunctival and nasal mucous membrane being injected and swollen, and the eyes and face puffed. Laryngeal and bronchial catarrh may also be present, as indicated by a harsh, dry, distressing cough, and rhonchal and sibilant râles over the lungs. There may, at the same time, be some redness and soreness of the throat. The eruption is usually of short duration, and desquamation, in the form of a fine, branny powder, begins on the sixth or seventh day of the fever, and lasts for a week or ten days. The patient during convalescence continues highly infective.

In well-protected and well-nursed children, measles usually runs a mild and favourable course; but occasionally cases occur of great gravity to which the term **malignant** measles is applied. The so-called **hæmorrhagic** form is now rarely seen. In this variety the rash is purpuric in character, and hæmorrhage occurs from all the mucous membranes: this form is rapidly fatal. A "typhoid" form has also been described; in this the fever is high and continued, the eruption is ill-developed, and of livid aspect, the pulse is quick and feeble, the tongue dry and brown, and drowsiness and delirium usually foretell a fatal end.

The most frequent as well as the most serious **complication**, and the one which is responsible for the deaths of most of the victims of this disease, is **broncho-pneumonia.** This is often attended in young children with extensive pulmonary collapse. Other complications which occasionally appear are severe intestinal catarrh (diarrhœa), acute laryngitis, epistaxis, troublesome ophthalmia, aural catarrh and deafness, and sometimes suppurative otitis. Of the more serious **sequelæ** we may mention catarrhal stomatitis and sometimes gangrene of the mouth (cancrum oris) or vulva, necrosis of the lower jaw, cervical glandular abscesses, and either *tuberculosis* of the bronchial glands, or tuberculous broncho-pneumonia, or miliary tuberculosis. So that measles appears as a very serious malady when regarded from the point of view of its complications and sequelæ. The more formidable of these are doubtless due to secondary invasion by septic and pyogenic micro-organisms.

With regard to the **treatment** of measles: * as we have already said, the mild and favourable forms, occurring in children of good constitution and sound health, require little besides isolation and confinement to bed in a *warm* room of a temperature of 65° to 70° F. and protection from all possibility of chill from currents of cold air. The room may advantageously be darkened if the coryza and photophobia are severe. We should give the patient light and fluid food. Warm drinks, and warmth to the surface, certainly favour the complete and early development of the rash; and we believe, by promoting the early and full development of the eruption on the skin, we help to protect the child from respiratory complications. Although, in many cases, not absolutely necessary, we think it always desirable to order a diaphoretic mixture. In the first place, it promotes the early and complete development of the rash, and it impresses the patient's family with the need of careful nursing and protection from unfavourable influences. It is an error to treat lightly any case of measles, however mild the attack may at its onset appear to be. The following is a simple and useful medicine for the purpose we have named :—

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* The measures necessary for isolation and prophylaxis we have already fully dwelt upon in the two preceding sections, but owing to the very early infectivity of cases of measles they often fail in their object.

℞ Potassii nitratis	ʒj.
Liquoris ammonii acetatis	℥ij.
Vini ipecacuanhæ	♏xx.
Syrupi limonis	ʒvj.
Aquæ	ad ℥vj.

Misce, fiat mistura. One to three teaspoonfuls, according to age, every four or five hours.

The bowels should be regulated, and a gentle aperient, such as a dose of citrate of magnesia, given if necessary. The child may be allowed to drink freely of barley water or lemonade. During desquamation the child should be daily anointed with a mixture of 1 in 20 of eucalyptus oil and olive oil after having been well sponged with hot water and carbolic soap.

In the milder forms nothing more will be needed. As the eruption fades, a quinine tonic may be given twice a day, and a gradual return to the ordinary diet may be permitted. The convalescence must, however, be carefully watched, the tendency to the development of tuberculosis borne in mind, and every possible risk of catching cold guarded against. The nutrition of the child must be carefully looked to; cod-liver oil may be given with advantage. In winter, or in inclement seasons, confinement to the house, for a month after the eruption has disappeared, is desirable. In fine weather a change to the sea-side often proves useful, of course *after* all risk of diffusion of the disease has disappeared.

But in more severe cases other measures may be necessary. Cough may be troublesome simply from pharyngeal or laryngeal catarrh, and some sedative and expectorant may be required to relieve it. The following syrup will be found of use. When the cough is very dry and hard, a tablespoonful of hot water should be added to each dose :—

℞ Sodii bicarbonatis	gr. xxxij.
Ammonii chloridi	gr. xvj.
Vini ipecacuanhæ	♏xij.
Spiritus chloroformi	♏xlviij.
Syrupi tolutani	ʒvj.
Aquæ	ad ℥ij.

Misce, fiat mistura. One or two teaspoonfuls occasionally for the cough.

If the laryngeal irritation is severe and the cough troublesome at night, preventing the child from sleeping, a grain or two of Dover's powder may be mixed with a dose of the above and given at bed-time. A steam tent is also useful, and so are hot fomentations to the larynx frequently renewed.

If bronchial catarrh is developed, the chest should be enveloped in a jacket poultice and some counter-irritant applied. One of the best is equal parts of turpentine liniment (B.P.) and olive oil, rubbed in freely and frequently over the front and back of the chest by the warm hand of the nurse covered with a flannel glove. A steam tent is needed, and we have found the inhalation of a warm spray consisting of 1 dram of glycerine of carbolic acid and 10 grains of sodium bicarbonate to an ounce of hot water most useful in the treatment of these infective ailments affecting the respiratory passages.

Mentholated vaseline may be applied to the nostrils with a camel-hair brush, for the coryza, when severe.

To promote expectoration, hot milk mixed with Apollinaris water, an ounce or two at a time, with half a teaspoonful to a teaspoonful of brandy, should be given every hour or two. An ammonia and senega mixture should also be prescribed:—

℞ Ammonii carbonatis	gr. xxxij.
Ammonii chloridi	gr. xxiv.
Tincturæ senegæ	♏lxxx.
Aquæ chloroformi	ad ℥iv.

Misce, fiat mistura. One to four teaspoonfuls, according to age, every two or three hours, in a little milk and water.

Dry-cupping has been recommended to relieve attacks of severe dyspnœa. If the temperature keeps high, with a burning, dry skin, sponging the body with tepid water may be useful, and grain doses of quinine every three or four hours, dissolved in lemon-juice and water, will be the best antipyretic.

Constipation is best relieved by small enemata of warm water containing a teaspoonful or two of glycerine; or of warm soap and water with a little olive oil or castor oil. Purgatives by the mouth should be avoided, owing to the tendency to severe diarrhœa. If diarrhœa occur it must be promptly treated by a bismuth and chalk mixture, with a few grains of compound kino powder in each dose.

The occurrence of convulsions, or of restlessness and delirium, must be met by the administration of sodium bromide, or, if this fail, by chloral enemata. Should the convulsions be associated with a recession, or an imperfect development, of the eruption, the child should be put into a hot bath, the head being at the same time bathed with iced water.

Epistaxis, when continued and profuse, may require the insufflation of astringents such as powdered alum or tannin; or even plugging the nares may be necessary. The sequelæ of measles, such as cancrum oris, etc., must be treated on the same general principles as apply to them when they occur in other circumstances.

RÖTHELN, RUBELLA, GERMAN MEASLES.

This is a contagious eruptive fever, which usually runs a very mild course, and is attended by a measles-like eruption and enlargement of the lymphatic glands in the posterior cervical and mastoid regions.

Some slight catarrh of the eyes, nose, and throat, occasionally present, gives it a decided likeness to measles.

It occurs often in wide-spread epidemics, frequently attacking adults, and previous attacks of measles or scarlet fever afford no protection against it. On the contrary, recent convalescence from these and other acute diseases seems to favour its attacks. It was at one time regarded as a hybrid between measles and scarlet fever, but now it is universally recognised as a specific infection.

Its incubation stage is, on an average, about ten days, but it has been variously estimated at from seven to twenty-two days. It is distinguished from measles by the slightness or absence of the catarrhal symptoms, the mildness of the onset, the absence or slight amount of pyrexia, the tenderness of the posterior cervical glands, and the brighter colour and less diffused character of the rash.

A severe form of rötheln occasionally occurs, and then the cases bear a great resemblance to those of severe measles.

The *treatment* consists in brief isolation—a week or ten days from the disappearance of the eruption—which may be hastened by warm baths and frictions; mild salines and gentle aperients if necessary; light food, and in the more severe cases the same kind of management as that indicated in measles.

ERYSIPELAS.

Erysipelas is an acute febrile infective inflammation of the skin, which also affects the mucous membranes that are continuous with the skin. It is attended by redness and swelling of the area affected, and is prone to spread rapidly over the surface, but it is always limited by a sharply defined margin. It is caused by the entrance into the skin or mucous membrane, through some abrasion or injury, of a well-known micro-organism, identical with the *streptococcus pyogenes*, but termed *streptococcus erysipelatos* when associated with this disease. This organism is found in the lymphatic vessels and spaces at the spreading margin of the affected surface;* it is also known to be the cause of many other forms of septic disease, and if, in cases of this disease, it reaches the subcutaneous tissues *cellulitis* is produced, while if it gets into the blood it gives rise to a general septicæmia. Erysipelas was a common epidemic in the surgical wards of hospitals before the advent of "antiseptic" surgery. It usually arose in connection with defective hygiene, and, having attacked one case, rapidly spread to others. It often appeared to cling to particular beds or wards or parts of wards. Its relation to *puerperal fever* has long been known, and bacteriological investigations have shown that the same pathogenic organism is the active agent in both this disease and erysipelas.

It seems certain either that varying degrees of virulence are manifested by the same streptococcus, or that varying degrees of infectibility exist in persons attacked, and this must be taken as accounting for the different results attending infection by it.

It seems to be capable of multiplying outside the human body, and its virulence may possibly be increased by temporary and local external conditions.

The tendency observed in certain patients to relapses and recurrences of this disease points clearly to the existence of an individual predisposition to the malady. It has been suggested † that persons with chronic coryza and a tendency for fissures to form about the nostrils and lips, affording a point of entrance to the micro-organism, are particularly prone to be thus affected. The predisposition seems to be sometimes inherited.

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* According to Metschnikoff and others it is in the uninvolved tissue beyond this margin that an active struggle takes place between the micrococci and the leucocytes (phagocytosis).

† Nothnagel's "Encyclopædia of Practical Medicine," English translation, art. "Erysipelas."

The frequent occurrence of relapses after an interval of many months has given rise to the hypothesis of "retained slumbering germs." Among predisposing agents we must include chronic alcoholism, chronic Bright's disease, a low, depressed state of health, and bad hygienic surroundings. The period of incubation may be very brief, not more than seven to ten hours; in other cases it may be six to eight days or longer. The subsequent severity of the case seems to be quite independent of the length of the incubation period, and wholly dependent on the degree of virulence of the streptococcus and the individual predisposition.

The mode of onset of the disease varies; sometimes the local manifestation seems to precede the constitutional symptoms; but frequently the disease commences somewhat suddenly with a severe rigor and a simultaneous appearance of the eruption.

The face is the part most commonly attacked, and the immediate neighbourhood of the eyes the situation first affected.

The eruption spreads rapidly, and is attended in the part affected with a feeling of pain and tension. The skin is hot, red, tender, tense and shining, and the inflamed part is sharply defined and separated from the adjacent healthy skin by an elevated margin. Its course is often checked where the skin is dense and firmly attached to subjacent tissues; and where the skin is loosely connected with subjacent parts inflammatory œdema is marked, as in the eyelids, prepuce, labia, and scrotum. After two or three days the redness and swelling disappear in the part first attacked, and extend into adjacent parts. In severe attacks vesicles and bullæ appear on the inflamed surface. The face is often greatly swollen, the eyes are closed by the swelling, the lips œdematous, and the features distorted and unrecognisable.

There is usually some lymphadenitis affecting neighbouring glands and occurring early in the attack. The daily advance and spread of the sharply defined raised margin, while the area first attacked becomes pale, smaller in extent, and undergoes desquamation, is very characteristic of this disease. Great variability may, however, be noted in the rapidity of the advance as well as in the extent of surface covered. Its *duration* depends on its extent. When the face and scalp alone are involved it rarely lasts longer than eight or nine days; but if it wanders extensively over the body it is apt to recur in places originally or earlier attacked, and thus it may last several weeks.

Accompanying the initial rigor there are usually vomiting and a rise of temperature to 104–105° F. As a rule the rise of temperature bears a close relation to the severity of the dermatitis, disappears with it, and returns with its recurrence. Some authorities maintain that certain cases of erysipelas run an *afebrile* course, but this is doubted by others.

When erysipelas attacks first the mucous membrane of the throat its true character cannot be determined until the eruption appears in the skin. We must bear in mind that pharyngeal erysipelas may extend to the larynx, and thus give rise to very serious obstruction to respiration.

Erysipelas of the head and face is almost always accompanied by headache, and not rarely by restlessness and slight delirium. Various septic complications may arise from the escape of the streptococci into adjacent parts; thus we may have cellulitis, meningitis, pneumonia, endocarditis, pericarditis, peritonitis, etc. etc., all of septic origin. The affected glands may suppurate, and purulent œdema may develope. Acute nephritis is rare, but febrile albuminuria is common.

A tendency to recurrence is more common in this than in any other acute infective disease. The protection afforded by one attack is slight and of short duration.

The foregoing brief sketch of the chief clinical features and course of this disease will serve as a fitting introduction to a consideration of its **treatment.**

With regard to *prophylaxis*, it is almost superfluous, nowadays, to insist on the urgent need for rigid isolation of erysipelas from surgical wards. This is universally understood and carried out. It seems to us almost equally important to isolate this disease also from medical cases, as breaches of surface, bed-sores, etc., are of common occurrence in medical wards, and the fact that it may attack the throat should not be overlooked. Some hospital authorities think it advisable to *isolate* all cases of severe *sore* throat for a few days, lest erysipelas or latent scarlet fever should be accidentally introduced into the general wards. We have already called attention to the suggestion that the subjects of "habitual erysipelas" frequently suffer from chronic nasal catarrh with itching of the nose, and in their attempts to relieve this they cause abrasions of the surface through which the infective cocci may gain entrance. It is said that treatment of the nasal condition has been found to permanently prevent the return of erysipelas. Lenhartz, of Hamburg, who makes this statement, claims to have cured this tendency by ordering cold cream to be rubbed into the nostrils night and morning, not only anointing the alæ but sniffing it well up the nostrils.*

Various measures have been suggested and applied *locally* to relieve the pain and tension, to arrest the extension of the advancing dermatitis, and to destroy the infective agent *in situ*. A few of these may be mentioned, but a great number have been discarded, after prolonged trials, as they have not been found to fulfil the expectations of those who introduced them. The attempt to limit the extension of the inflammation by *mechanical* means, such as *strips* of *adhesive plaster*, elastic bands, broad circular strips of *collodion*, has not obtained much popularity, although good results have been reported. These measures aim at mechanically preventing the spread of the germs into adjacent tissues.

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* Nothnagel's "Encyclopædia of Practical Medicine," English translation, art. "Erysipelas."

Other practitioners have thought that they could prevent the growth of the organism by keeping the air from the affected surface. Rubber protective has been used for this purpose, applied smoothly and firmly over the whole erysipelatous area and a hand's breadth of healthy skin beyond. Painting the same extent of surface repeatedly with collodion or a combination of collodion and ichthyol has been extensively employed. The latter has been used of a strength varying from 10 to 50 per cent., and painted on in a tolerably thick layer. The use of ichthyol is regarded by many as acting beneficially by a special effect on the streptococci, and they use an ichthyol ointment made by mixing it with vaseline in the proportion of 25 to 50 per cent. This ointment is rubbed in daily over and somewhat beyond the affected surface. Some apply these inunctions twice or thrice daily, after previously washing the skin with soap and water or a solution of salicylic acid. The surface thus anointed is covered with moist gauze, and with cotton-wool which is kept in position by a lightly applied bandage.

This ichthyol treatment has been warmly commended by many authorities, and somewhat disparagingly criticised by others.*

Some simply dust the surface over with a mixture of zinc oxide and salicylated starch and cover with cotton-wool; or subnitrate, or, better, subgallate of bismuth ("dermatol") is used, or a powder made by shaking up ½ an ounce each of zinc oxide and lycopodium powder thoroughly with 15 to 30 minims of liquefied carbolic acid.

Another favourite application is a powder composed of equal parts of boric acid, starch, and zinc oxide; this is kept on by lint and a bandage, and if the face is affected a mask is applied. Pain may be relieved by a lead and opium lotion.

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* *See* Nothnagel's "Encyclopædia of Practical Medicine," art. "Erysipelas."

The application of various antiseptic agents at and a little beyond the margin of the spreading area has been much practised. Tincture of iodine has been so used, so has an ointment of iodoform and creolin, so has painting with a stick of lunar caustic; various applications containing corrosive sublimate, carbolic acid, resorcin, etc. etc. (including the subcutaneous injection of a 2 per cent. solution of carbolic acid). Dr. Lobit, of Biarritz, maintains that he has been able to abort many attacks by the application, first at the spreading margin, and then over the whole surface affected, of a collodion containing 10 per cent. of iodol. A thick layer is applied with a brush, care being taken to pass one or two centimetres beyond the inflamed margin. Some have gone to the extent of making incisions into the skin before applying these antiseptic agents, but it cannot be said that any of these methods have been so uniformly successful as to merit general adoption, and the simpler measures amongst those we have enumerated are perhaps still the most commonly practised.

Bathing the head with iced water will often relieve the severe headache; and tepid baths, with cold irrigations, may be needed when there is much fever with restlessness and insomnia.

Early tracheotomy may be required in laryngeal erysipelas.

Of internal remedies, the tincture of the perchloride of iron given frequently (every three or four hours) in full doses (20 to 30 minims) has been found of much value in this country; quinine also, in 3- to 5-grain doses, has been found beneficial.

Sodium salicylate internally and externally has been highly extolled as a remedy for erysipelas by Hallopeau, J. W. Moore, and others. Compresses soaked in a 1 in 20 solution of sodium salicylate are applied to the inflamed surface, and covered with oil-silk, and frequently renewed. Internally about 60 grains of the salicylate are given daily, or this salt is given on alternate days and quinine on the intermediate ones. If cerebral symptoms or dyspnœa become prominent, this treatment is suspended.

A few doses of phenacetin may be given when the temperature is high and the patient becoming restless; or it may be needful to relieve insomnia and delirium with a mixture of chloral and bromides, or, in some cases, opium may be required.

In threatened heart failure, digitalis may be necessary, or strychnine, or ether hypodermically. *Lenhartz* speaks highly of Merk's *digitoxin*, $\frac{1}{260}$ grain three or four times daily, but after 6 or 8 doses its administration must be suspended for 24 hours; it should never, he says, be given for more than a week.

Old and feeble people will require to be supported by alcoholic stimulants; but these should not be given in a routine fashion, as is too common. The diet should be light and nourishing, and consist of milk, beaten-up eggs, clear soups, and broths. For the thirst, cold tea, iced home-made lemonade, or water flavoured with fruit juice can be prescribed *ad libitum*. The bowels should be kept regulated from the onset by gentle aperients if needed.

A brief reference must now be made to the **serum treatment** of erysipelas. In a self-limited disease like erysipelas, and one presenting, at different times, such varying degrees of virulence, it is needful to be very cautious in the conclusions we arrive at as to the effect of any new and untried remedy. This remark seems particularly applicable to the conclusions which were arrived at by those who first applied the anti-streptococcus serum to the treatment of this disease.

Marmorek's serum was obtained by inoculating animals (the horse especially) with regularly increasing quantities of highly virulent streptococcus cultures. Serums of increasing potency were thus obtained.

Chantemesse was one of the first to report the results obtained by the treatment of erysipelas with this serum. His conclusion was that "it was productive of more favourable results than every other therapeutic measure." But this highly favourable estimate has not been supported by the experience of subsequent observers.

Osler* remarks that "notwithstanding some apparently favourable results, its value in the treatment of common infections has not been demonstrated," and Lenhartz observes, "From my own experience in the treatment of erysipelas with Marmorek's serum obtained directly from the Pasteur Institute, I must advise against its further employment at this time."† He considers his cases not only demonstrated the "absolute inefficiency" of the serum, but showed also that the "most disagreeable after-effects" may follow its use. Amongst these were rigors and high fever, a general exanthem, severe pains in the muscles and joints, with swelling of the latter; "no joint was spared;" and the nerve trunks were markedly sensitive to pressure.

We cannot close our account of the treatment of erysipelas without alluding to the remarkable effect which an attack of this disease sometimes exerts on certain sarcomatous tumours and certain chronic skin affections. Complete disappearance of sarcomatous growths has been repeatedly observed, and patients have been inoculated with erysipelas as a curative agent; but this treatment has been abandoned on account of the severity of the symptoms thus induced. Now, however, the *toxins* obtained by cultivating the *streptococcus erysipelatos* and the *bacillus prodigiosus* together in *bouillon* (Coley's fluid) have been used for the same purpose, and in many instances with success.

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* "Practice of Medicine" (fourth edition), p. 158.

† Nothnagel's "Encyclopædia of Practical Medicine," art. "Erysipelas."

ADDITIONAL FORMULÆ.

SMALL-POX.

Febrifuge mixture in initial stage of small-pox.

℞ Spiritus ætheris nitrosi, ℥ss.
Syrupi limonis, ℥ss.
Liquoris ammonii acetatis ad ℥vj.

M. f. mist. Two or three teaspoonfuls every two hours in a little ice-water. (*Welch.*)

Carbolic acid mixture in small-pox.

℞ Acidi carbolici, ♏xv.
Tincturæ cinchonæ, ʒijss.
Syrupi aurantii, ʒiv.
Mucilaginis acaciæ, ℥j.
Aquæ ad ℥v.

M. f. mist. A tablespoonful every two hours. (*Audhoui.*)

In hæmorrhagic small-pox.

℞ Extracti ergotæ liquidi, ʒiij.
Olei terebinthinæ, ʒiij.
Spiritus ætheris nitrosi, ʒij.
Spiritus rectificatus, ℥j.
Ovi vitellum, ℥j.
Aquæ menthæ piperitæ ad ℥viij.

M. f. mist. An eighth part every third, fourth, or sixth hour, as required.
(*J. W. Moore.*)

Local application for the eruption.

℞ Linimenti calcis ad ℥viij.
Olei eucalypti, ℥ss.
Calaminæ præparati, ʒj.

M. f. applicatio. To be applied with a large camel-hair brush to the skin of the face every two or three hours.
(*Whitla.*)

Ointment for the eruption.

℞ Acidi salicylici, ʒj.
Pulveris amyli, ʒx.
Glycerini, ℥iv.

M. f. ung. To be applied on lint to the face. (*Lewentauer.*)

Ointment and powder (disinfecting) for small-pox.

℞ Sodii salicylatis, ʒj.
Vaselini, ℥iij.

M. f. ung. Apply to the parts affected, and afterwards dust them with a powder composed of 2 drams of sodium salicylate and 3 oz. of talc.
(*Baudon.*)

Iodine application for the pustular stage of small-pox.

℞ Tincturæ iodi, ♏lxxv.
Glycerini ad ℥ij.

M. f. app. To be applied to the skin with a brush every four hours. (*Pioch.*)

SCARLET FEVER AND ERYSIPELAS.

Chlorine mixture for scarlet fever.

℞ Pulveris potassii chloratis, gr. viij.
(Pour on this in a pint bottle):
Acidi hydrochlorici puri, ʒj.
(Cork the bottle and shake occasionally.)
Aquæ ad O j.

After a time, add the water little by little, shaking at each addition (in cold weather the bottle should be first warmed).

A tablespoonful, or two, of this mixture, according to age, may be given frequently. An adult may take the whole pint in a day. (*Watson.*)

"Diaphoretic, diuretic, and laxative" mixture for scarlatinal nephritis.

℞ Potassii acetatis
Potassii bicarbonatis } āā ʒij.
Potassii citratis
Infusi tritici repentis ad ℥viij.

A teaspoonful every three or four hours for a child of five years. (*J. Lewis Smith.*)

Quinine mixture in mild cases of scarlet fever.

℞ Quininæ sulphatis, gr. xvj.
Syrupi pruni virginiani, ℥j.
Syrupi yerbæ santæ, ℥j.

M. f. syrup. One teaspoonful every three or four hours for a child from three to five years old.
(*Prof. J. Lewis Smith.*)

Diaphoretic mixture in early stage of scarlet fever.

℞ Spiritus ætheris nitrosi, ʒij.
Potassii citratis, ʒj.
Liquoris ammonii acetatis, ℥jss.
Syrupi simplicis, ℥j.
Aquæ camphoræ ad ℥iv.

M. f. mist. A teaspoonful every three hours. (*Whitla.*)

Mixture for scarlatinal nephritis.

℞ Potassii acetatis, gr. xx ad gr. lx.
Syrupi simplicis, ʒiij.
Infusi digitalis, ʒx.
Aquæ ad ℥iij.

M. f. mist. A teaspoonful every two hours.
(*Widerhofer.*)

Tonic powders during convalescence from scarlet fever.

℞ Ferri carbonatis saccharatæ, gr. viij.
Quininæ sulphatis, gr. viij.
Sacchari albi, gr. xl.

M. et divide in pulv. x. One night and morning.
(*Widerhofer.*)

For scarlet fever with diphtheritic throat affection.

R Potassii chloratis, gr. xx.
Syrupi aurantii, ʒiij.
Decocti cinchonæ ad ℥iij.

M. f. mist. A teaspoonful every two hours.

℞ Potassii chloratis, ʒj.
Aquæ, ℥xij.

M. f. gargar.

(The diphtheritic spots to be also touched with pure lactic acid.) (*Widerhofer.*)

Spray for the throat in scarlet fever.

℞ Glycerini boracis, ʒiv.
Glycerini acidi carbolici, ʒiij.
Aquæ rosæ ad ℥x.

M. (*Whitla.*)

Antiseptic application for the fauces when foul and offensive in scarlet fever.

℞ Acidi carbolici, ♏x.
Liquoris ferri subsulphatis, ʒiij.
Glycerini } āā ℥j.
Aquæ

M. f. applic. To be applied with a large camel-hair pencil every three to six hours.
(*J. Lewis Smith.*)

Lotion for the itching of the skin in scarlet fever.

℞ Acidi carbolici, ʒj.
Tincturæ camphoræ, ℥ij.
Aquæ puræ, O j.

M. f. lotio. Shake well and apply over surface when needed for pruritus.
(*Prof. J. Lewis Smith.*)

Chloral enemata for eclamptic convulsions in scarlet fever.

℞ Chloral hydrate, ʒss.
Decocti althææ, ℥vj.

M. A fourth part to be injected into the rectum the moment the convulsions commence. (*Widerhofer.*)

Ether and camphor injection (hypodermic) in case of collapse.

℞ Camphoræ, ʒss.
Ætheris, ʒv.

M. Twenty minims to be injected under the skin.

(*Widerhofer.*)

Ointment for erysipelas.

℞ Creolin, 1 part.
Iodoform, 4 parts.
Lanolin, 10 parts.
M. f. ung. (*Koch.*)

Spray for erysipelas.

℞ Hydrargyri perchloridi
Acidi citrici āā gr. xv.
Alcohol absolute, ʒjss.
Ætheris sulph. ad ℥iij.

M. f. applicatio. The spray to be followed by boric acid lotion and 1 per cent. ethereal solutions of sublimate.

(*Cayet and Talamon.*)

Mixture in erysipelas.

℞ Ammonii carbonatis, ʒjss.
Decocti cinchonæ, ℥vj.

M. f. mist. Two tablespoonfuls with a tablespoonful of fresh lemon-juice every four or six hours. (*Moore.*)

Mixture in erysipelas.

℞ Tincturæ ferri perchloridi, ʒijss.
Quininæ sulph., gr. xxiv.
Spiriti chloroformi, ʒii.
Aquæ ad ℥vj.

M. f. mist. Two tablespoonfuls every three or four hours.

(*J. B. Y.*)

Application to prevent the spread of erysipelas.

℞ Argenti nitratis, gr. lxxx.
Acidi nitrici, ♏vj.
Aquæ destillatæ, ℥ss.

M. f. solutio. To be painted over the inflamed surface and for two or three inches beyond it two or three times a day.

(*Higginbottom.*)

The Jenner Institute has issued the following memorandum as to the use of antistreptococcic serum:—

> The antistreptococcic serum is supplied by the Institute for the use of medical practitioners who desire to try it in severe cases of streptococcic infection. (Price 7s. 6d. for $30^{\text{ccs.}}$)
>
> The remedy is still on its trial, and, although several recoveries have been reported after the use of the serum, the number of cases on record is not sufficient to warrant an absolutely safe conclusion. On the other hand, it has been shown that no lasting unfavourable effects have up to the present followed its administration.
>
> It is advised that $10—20^{\text{ccs.}}$ be injected in one dose into the subcutaneous abdominal tissue, and that further doses be injected every twelve or twenty-four hours until the temperature has returned to normal.
>
> In order to enable the medical profession to form an idea of the value of this new remedy, it is of the utmost importance that medical practitioners should forward *full notes of the course of the disease, and of its termination, whether favourable or unfavourable.*
>
> The Institute is prepared to undertake the bacteriological diagnosis in each case *free of charge*, and a special box for the transmission of specimens is sent out with each case of serum if desired

CHAPTER IV.

THE TREATMENT OF TYPHOID OR ENTERIC FEVER, AND OF TYPHUS FEVER.

TYPHOID FEVER — Nature and Origin of the Disease — The Typhoid Bacillus — Diffusion — Characteristic Lesions — Symptoms and Course — Prophylaxis and Disinfection —Indications for *Treatment*—General and Special—The Personal Care of the Patient — Diet — Stimulants — Antiseptic Treatment—Intestinal Antisepsis—Various Antiseptic Agents used—Chlorine and Quinine—Good Results of this Method—Calomel—Sulphurous Acid—Naphthol—Salicylate of Bismuth —Thymol—Carbolic Acid—Turpentine—Salol—Oil of Eucalyptus — Urotropine and Bacilluria — Hydrotherapy, etc.—Treatment of Complications — Hyperpyrexia — Cold Applications — Diarrhœa — Hæmorrhage — Perforation — Cardiac Asthenia and Pulmonary Congestion—Nervous Symptoms—Bed Sores—Convalescence.

TYPHUS FEVER.

Additional Formulæ.

TYPHOID FEVER.

WE cannot here enter into a detailed examination of the history, pathology, and clinical course of **typhoid fever**; we shall only therefore call attention to those facts in connection with its origin, dissemination, symptoms, and course which are essential to a comprehension of its true character, and which may enable us to establish rational indications for its treatment. Moreover, the history, pathology, and morbid anatomy of this disease have been so well studied and so frequently described, and its clinical course and results are so well known, that we should only be going over ground familiar to most of our readers in dwelling at any length on these details.

With regard to the mode of origin and nature of this disease, it is now generally known that it is an infective bacillary disease, caused by the introduction into the human body of a specific pathogenic organism —the so-called **bacillus** of Eberth, or the *bacillus typhosus*. This is a rather short, thick, flagellated, mobile bacillus, having rounded ends, at one or both of which there is seen a glistening, round body, at one time thought to be a spore, but no longer so regarded. It can be cultivated in nutrient media, and grows on potatoes in a characteristic manner. It resembles in many respects the *bacterium coli commune*, but it can be differentiated from it as well as from other bacilli with which it has been confounded.

The *bacillus typhosus* fulfils two of the three conditions necessary to establish its causal relation with typhoid ; it is constantly present in the characteristic lesions, and it grows outside the body in a specific manner. The third condition—viz. the experimental production of the disease by the introduction of pure cultures into the bodies of healthy animals—has not yet been fully realised, owing to the difficulty, or probably the impossibility, of producing typhoid in the animals hitherto experimented upon. By giving, however, intensely virulent cultures to rabbits and rats, with their food, Remling appears to have succeeded in producing infiltration and ulceration of the agminate glands. Cultures of this bacillus are killed by a temperature of 60° C., and those on bouillon by solutions of carbolic acid 1 in 200, and of sublimate 1 in 2,500. This organism will resist drying for months, and in sterile water outside the body it will retain its vitality for weeks, and it may live many weeks in ice. In milk it is said to undergo rapid development; whether it does so also in water is not known for certain. It will live in butter made from infective cream for many days. In the upper layers of the soil it appears to retain its vitality for months, and so it does also in fæces. In certain epidemics it has been actually detected in the infected water supply. It retains its vitality for many weeks when mixed with sand or earth and dried ; it may therefore be blown about in dust, and this mode of spread of this disease under certain circumstances has not, perhaps, hitherto been sufficiently realised. *Uncooked* substances used as food, if exposed to dust or water infected with these bacilli, may be the means of conveying the disease. The bacilli have been found in the pallial cavity and in the intestine in oysters and other bivalves living in water that has become contaminated by sewage. In man the typhoid bacilli are found in the lymphoid tissues of the intestine, in the mesenteric glands, and in the spleen and liver, also in the blood, the bile, the urine, and the fæces.

In some cases the bacillus becomes *widely diffused* through the organism, and has been found in the cerebral meninges and ventricles and in secondary abscesses.

This organism is clearly, then, the **infecting agent.** How does it become disseminated so as to communicate the disease from the infected to the non-infected ? Although it is mainly given off in the stools and in the urine of typhoid patients, yet it is sometimes *directly* communicated from sick persons to the attendants, or others brought into contact with them. This probably arises through want of sufficient precaution in handling the patients, or the linen soiled by their evacuations. We have known the infection to cling to a particular bed in a general hospital and infect a succession of patients admitted with other disease, until the bed was removed. It therefore appears certain that, if great care and cleanliness are not observed with regard to the bed and body-linen of the patient, the infection may be diffused through the air immediately around the patient from the dried excretions.

The *direct* conveyance of infection must always be due to some defect in details of cleanliness and caution. The most common mode of *indirect* communication is undoubtedly through the contamination of *water* by typhoid dejecta. The origin and spread of many epidemics have been clearly shown to be so produced. The presence, sometimes in great abundance, of typhoid bacilli in the urine has only been realised of late years, and as they may persist in this fluid for some time after recovery, diffusion of the disease may in some instances have been due to our ignorance of this danger. *Milk* is a common vehicle of dissemination (usually from the use of contaminated water for washing the milk cans), and in this fluid the germs are said to multiply rapidly. The *gases* escaping from infected sewers are not themselves infective, but in their escape, especially under pressure, they mechanically convey the solid germs where they may become the source of mischief. Having entered the human body, which they almost invariably do by the mouth, and having reached the intestinal canal, these germs appear to pass through the epithelial lining to the subjacent lymphoid tissue, where they excite a specific irritation which leads to active cell proliferation. If this hyperplasia of the lymph-follicles reaches a certain degree from excessive action of the poison, necrosis occurs with the formation of an ulcer. It is probable that in the development of the bacilli certain toxalbumins are produced, and these passing into the blood give rise to the constitutional febrile disturbances. At the same time the mesenteric glands, the spleen, and the liver become affected by the action of the bacilli, and become enlarged—particularly the spleen and the mesenteric glands. In a certain proportion of the cases an intestinal catarrh with diarrhœa (pea-soup-like evacuations) accompanies the intestinal ulceration. Susceptibility of the individual plays a certain part in the incidence of this disease. Persons between the ages of 5 and 35 are most liable to be attacked. It is rare after middle age, but when it occurs then it runs a severe course. The immunity conferred by an attack is considerable, but not absolute.

The **intestinal lesion** is the most characteristic and the most important one in typhoid fever. There may be only a few small superficial ulcers, or the ulceration may be extensive, and involve large tracts of mucous membrane. There are cases in which *no* intestinal lesion has been found, but these are very rare. The ulcers are most common at the lower part of the ileum. The solitary glands of the cæcum and colon are also frequently affected, and may go on to ulceration. This intestinal ulceration is the cause of two of the most serious incidents of the disease—*i.e.* peritonitis from perforation of the floor of the ulcer, and hæmorrhage during separation of the sloughs. The spleen is always more or less enlarged, sometimes considerably so, and the liver generally, but not always. The mesenteric glands corresponding to the affected part of the intestine are also swollen. Bacilli are found in large numbers both in the spleen and the mesenteric glands. Degeneration of the myocardium, hypostatic congestion of the lungs, bronchitis, ulcers of the larynx, and morbid changes in many other organs may arise in the course of the severer forms of the disease.

The main **symptoms** of the fever are briefly these :—During the incubation period, which lasts on the average about ten to fourteen days, there is complaint of lassitude and weariness; then the disease sets in with chills, headache, loss of appetite, nausea, pain in the limbs and back, frequently slight bronchitis, and occasionally epistaxis; the temperature usually rises steadily in a step-like manner, day by day, during the first week, until it reaches 103° to 104°, or higher; there is a quick pulse, 100 to 120, of low tension, and often markedly dicrotic; the tongue is coated with a yellowish-white fur, and the tip and edges are characteristically clean and red; there may be slight rambling at night; slight diarrhœa may already appear; but, on the contrary, the bowels are often constipated at this stage, and, in many cases, remain so; some enlargement of the spleen may be detected about the end of the first week (though not always to be made out); and at this period the characteristic *rose-spots* begin to appear usually on the abdomen and the back and lower part of the chest (recently the *bacillus typhosus* has been isolated from these rose-spots, so that they appear to be specific in nature and the result of the presence of this organism); some cough from bronchial catarrh is not uncommon. During the second week the temperature remains high, and the morning remissions are slight, there is dulness of intellect, and the tongue becomes dry; if the case is severe and abdominal symptoms become pronounced, there are diarrhœa, tympanites, and tenderness, especially over the right iliac region. The urine has the usual febrile character: it is high-coloured, scanty, and of increased density; contains an excess of urea, uric acid, and of salts, except sodium chloride, which is diminished. In severe cases it often contains albumen. In the third week the temperature usually shows marked remissions in the morning, and the fever begins to decline, debility and emaciation are notable, and the diarrhœa and abdominal distension may continue. This is often the critical period in the illness, when unfavourable symptoms may appear, such as delirium, a dry, brown tongue, cardiac debility and pulmonary congestion, intestinal hæmorrhage or perforation.

Convalescence, in favourable cases, usually begins in the fourth week (in slight cases earlier), the temperature falls to normal, the diarrhœa (if there has been any) ceases, the tongue cleans, and the appetite is often ravenous: but in bad cases, those serious symptoms we have previously mentioned may become intensified, and the patient may lie in a state of profound prostration. **Relapses** are prone to occur. The *ordinary* relapse sets in, on an average, about five days after complete defervescence; in some instances it has been known to be deferred for three weeks or longer. The symptoms are the same as those of the original attack, but its course is usually shorter and less severe. It is not uncommon to meet with what are termed "*intercurrent*" relapses; in such cases the relapse overlaps the original attack, and the temperature, after falling for a few days to 100° or 101°, again rises, and the patient passes through another attack, which may be even more severe and protracted than the first.

Great variations in the course and severity of cases of typhoid are observed in different epidemics, and we should be especially on our guard with respect to what has been termed the "*ambulatory form*," in which the initial symptoms have been so slight and indefinite that the patient keeps on with his usual occupation, and may only come under our notice in the middle or towards the end of the attack. Then very serious symptoms may set in, and a rapidly fatal issue is not uncommon; in other cases the febrile symptoms are, all through the attack, so slight that it is with difficulty the patient can be made to realise that his illness is of a serious nature.

This brief sketch of the chief characters of typhoid fever will be supplemented, and filled in, by the details which will naturally arise for consideration in discussing questions of *treatment*. But before passing on to that part of the subject, it will be necessary to refer briefly to the matter of **protective inoculation**, which has recently been practised on a large scale. Typhoid fever is one of the chief scourges of armies in the field, as well as a danger to which travellers are often exposed in many parts of the world. It would lead to a great saving of human life if a trustworthy protective fluid could be discovered which could be applied, without any undue risk, as a prophylactic to those who are especially liable to exposure to this infection of typhoid. We are indebted to Professor Wright, of Netley, for the preparation of a *vaccine* which has been very extensively used for this purpose, especially in India and in South Africa. This vaccine consists of a bouillon culture of the bacillus typhosus of high virulence, raised to a temperature which kills all the organisms. The quantity injected is fixed at the dose which, "if injected alive, would be fatal to a 350-gramme guinea pig." The inoculation, which is usually made in the flank, causes a little local tenderness and congestion, with a slight rise of temperature and restlessness, sometimes nausea and faintness. These symptoms usually disappear in a day or two. To be effectual the injection should be repeated after a fortnight. The evidence as to the protective value of this method coming from South Africa is, at present, somewhat inconclusive. But, although some weighty opinions, of an unfavourable import, have been published, the balance of evidence seems to be in favour of the belief that it produces a relative but not an absolute protection. In many reports the percentage of persons attacked appears to have been much greater amongst the uninoculated than the inoculated, and the mortality amongst those attacked much lower amongst the inoculated than the uninoculated.

We now pass on to the question of general domestic.and individual **prophylaxis.** It should be borne in mind that typhoid is conveyed in the great majority of cases by polluted drinking-water; and whereas we should, at all times, be on our guard against drinking any water of the purity of which we are not absolutely sure, during the prevalence of this disease, or when travelling from place to place, we should be more especially careful to drink no water that has not been **boiled.** A filter, if kept sterile, is a convenient vessel in a house for the storage of drinking-water, but the water supplied to the filter should be boiled—a duty which should only be confided to a thoroughly trustworthy person. In travelling either a mineral table-water of known purity should be drunk, or some simple means for boiling water should be carried.

Milk is also a common medium for the conveyance of the typhoid germs, either owing to its dilution with impure water, or from the use of impure water for washing the milk cans; but milk being very absorbent, it may become contaminated by exposure to impure air. It is therefore a good rule in families that all milk should be boiled on being delivered, and subsequently stored in a closely-covered vessel.

The certainty that the germs of typhoid may be conveyed by the gases escaping under pressure from infected drains and sewers has led to the universal recognition of the necessity of thoroughly ventilating all soil-pipes, drains, and water-closets. Whether in the case of atmospheric infection the germs pass into the lungs, or, as some maintain, adhere to the mucous membrane of the mouth and throat, and so pass into the intestine, is uncertain.

The principle of prophylaxis, in dealing with an actual case of typhoid, is to destroy the vitality of the germs discharged from the intestine or bladder as soon as possible, and so prevent the infective organism being conveyed into the soil-pipes and drains, or otherwise disseminated.

In the case of a typhoid fever patient who is nursed at home, and not removed to a hospital, the following rules should be observed as closely as practicable. The patient should be isolated as completely as possible from the rest of the household, and only those in attendance upon him should be admitted into his room. Great cleanliness should be observed by the attendants, who should keep their hands frequently washed in carbolic lotion (1 per cent.), and should wear cotton or easily-washable dresses, which should be frequently changed, and discarded and cleansed immediately, if accidentally soiled by discharges from the patient. The bed-room should be preferably without carpets, curtains, or hangings of any kind, and should be kept well ventilated. The bed or beds (for it is best to have two side by side, so as to be able to move the patient easily from one to the other for cleansing purposes, etc.) should be in the middle of the room, not in a corner. The motions should be received in a bed-pan and disinfected as soon as passed. There are various ways of doing this. For an emergency, and in the absence of other disinfectants, *boiling* water may be used in the proportion of four or five times the bulk of the discharge; but this should not be trusted to when other disinfectants can be obtained. The best disinfectants for this purpose are—a 5 per cent. solution of chloride of zinc; fresh chloride of lime used freely; or "milk of lime"—*i.e.* slaked lime mixed with water so as to make a thick "white-wash," and added very freely to the dejections. Corrosive sublimate solution with excess of hydrochloric acid, when used of sufficient strength, is also very effectual, but it has two disadvantages—it is highly poisonous and it corrodes metal drain pipes. Burying the fæces without disinfection must not be thought of, as the typhoid bacillus maintains its vitality even nine feet below the surface. Whatever disinfectant is chosen it should be used very freely, and thoroughly mixed with the evacuations and kept in contact with them for a time (at least an hour) before they are thrown away; a little should always be put in the bed-pan before it is used. Urine passed by itself should be mixed with an equal quantity of 5 per cent. carbolic and allowed to stand for an hour; after the second week bacilli in the urine have been found, often in great abundance, in one-fourth of the cases.

Great care must be taken with regard to *soiled* linen, and mattresses must be suitably protected from penetration by the discharges. The body and bed linen, before removal from the bed-room, should be put into a 5 per cent. solution of carbolic acid, and at once conveyed to the laundry and plunged in boiling water, kept there for half an hour, and then washed with soap. The bed-clothes must not be shaken; those that do not come in contact with the body of the patient should be aired for eight hours daily. The feeding vessels should be frequently cleansed with boiling water, thermometers isolated and kept in 1—1,000 perchloride solution, which should be frequently renewed. Rectal tubes and syringes should be isolated and the former boiled after use. After action of the bowels the patient's nates should be cleansed with moist carbolised tow or cotton-wool, which should be immediately burnt. After the cure or departure of the patient, the air of the room may be disinfected by burning sulphur in the proportion of 5 drams to each cubic metre, the room being hermetically closed for twenty-four hours. The floor and woodwork of the room should be washed, and all dust removed by wet cloths wrung out in 5 per cent. carbolic or 1 in 1,000 sublimate solution. The room should be exposed to the air for at least a week after disinfection and before reoccupation.

As a further measure of disinfection, which is also refreshing and useful to the patient himself, we have recommended that his body should be lightly sponged, all over, twice a day, with the following cooling, disinfecting, and aromatic lotion :—

℞ Thymol	gr. xl.
Spiritus lavandulæ	℥ij.
Spiritus vini rectificati	℥iij.
Acidi aceti diluti	℥ij., ʒij.
Aquæ rosæ ... ... ad	℥xvj.

Misce, fiat lotio.

His skin is thus kept cleansed from contamination by excretions, and a cooling tonic influence is produced. It is also advisable to disinfect the mouth two or three times a day by washing it out with some Listerine and water (1 in 10 or 20). If the patient is unable to do this for himself, the nurse should cleanse the gums and teeth by means of a bit of cotton-wool tied to the end of a stick (which should be burnt after using) dipped in the mouth wash.

The air of the sick-room is freshened by placing pieces of blotting-paper, saturated with eucalyptus oil or pinol, on plates about the apartment. All food and drink should be carefully protected from *flies* and *dust*, especially in camps, and at all times and in all places during the prevalence of an epidemic.

Having established these prophylactic measures, we may next consider what are the indications which should govern the medical management of the patient.

We would suggest that there are two plain indications in the treatment of this disease. The one we would call *general*, because it applies to all acute febrile maladies, and the other *special*, because it applies in an especial manner to the disease we are now considering.

The *general* indication is of great importance; it is to support and strengthen the resisting powers of the organism while it is passing through a serious crisis. The *special* indication is not of less importance; it is to diminish the gravity of this crisis by opposing and counteracting, in whatever way we can, the morbid activities of the specific microbe with which the organism has become infected.

We will first consider the best means of carrying out the **general indication**—that is, the maintenance of the patient's strength.

The patient should be kept absolutely at rest in bed from the commencement of the fever. Removal to any distance, as for the sake of being nursed at home, must be resisted. The physical effort and exhaustion attending a long journey, in the early stage of the fever, has compromised many chances of recovery. The bed should be arranged so as to be thoroughly comfortable to the patient. The mattress must not be *hard*, or bed-sores may soon be induced. "A woven-wire bed, with soft hair mattress, upon which are two folds of blanket," will be both smooth and elastic. A water-proof cloth should be under the sheet. The patient should not be exposed to a glaring light; at the same time, it is quite needless to darken the room so much as is often done. In hot weather the air of the room may be cooled by means of a block of ice; in winter it should be kept at about 65° F. One or two good nurses will be required, according to the severity of the case. Great cleanliness of the body of the patient should be enforced by regular cold or tepid sponging with water or with the lotion we have already mentioned. It is as well to cut the hair short in severe cases, since it is apt to fall out during the illness, and cold applications to the head can be better applied, if they are needed. The value of two beds —one for day and the other for night—has been mentioned; it greatly favours cleanliness, it refreshes the patient, and it gives the opportunity of some little change of position, which, in protracted cases, may avoid the formation of bed-sores. The state of the bladder should be noted in cases with defective consciousness, and the urine withdrawn by catheter if necessary.

The question of **diet** is a most important one. We have elsewhere * considered at length the dietetics of fever, and we may repeat here the two principal rules that we have there formulated:—1st, To endeavour to utilise food, as far as is safe and possible, for the purpose of checking the waste of tissue associated with the febrile process. 2nd, To administer no food that cannot be readily absorbed and assimilated. Seeing that the functions of the digestive organs are gravely impaired, if food is given that the patient is unable to assimilate, it will decompose in the stomach and intestines, become a local irritant and augment the fever, and add seriously to the discomfort and danger of the patient.

The popular tendency is to **over-feed** the typhoid patient. In the acute stage of fever scarcely any food is digested. The function of digestion is, in severe cases, practically in abeyance. Fluids that *remain fluid* within the alimentary canal can alone be absorbed. Excess of zeal in feeding fever patients is the cause of much of the intestinal trouble that complicates these cases. Strong meat extracts, milk, wine, brandy, beaten-up eggs, gruel, etc., are given the patient in rapid succession, to accumulate in his intestinal canal and form a fermenting mixture, in which poisonous ptomaines may be formed; while pure cold water, one of the best of eliminators and antiseptics, and which should be given freely, is often withheld. Tympanites and painful flatulent distension of the bowels naturally arise from such feeding. In feeding a case of typhoid we should carefully note the digestive and absorptive capacity still retained by the patient, and the food should be kept within that limit. Excellent a food as milk is, it is a concentrated food,* and is apt to coagulate in the stomach and intestines into a *solid* curd, which may excite much irritation of the ulcerated and inflamed mucous membrane, and be passed by the bowel quite undigested. We should always be on the look-out for this, and in order to avoid it we should always give the milk freely diluted with some alkaline water, such as Vichy or Apollinaris; or a convenient and cheaper plan is to give the nurse some powders, each containing 3 grains of bicarbonate of soda, 3 grains of bicarbonate of potash, 2 grains of magnesia, and 3 grains of common salt, and let her add one such powder to each cup of milk and water. This will not only aid the digestion of the milk, but it will add to the food certain necessary salts which, in the absence of vegetable foods, the patient does not get, and common salt is an excellent antiseptic.

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* "Food in Health and Disease," part ii., chap. i.

If, notwithstanding these precautions, we find much diffused solid matter in the evacuations, consisting, as it usually does, of finely-precipitated casein, it is best to discard milk as a food entirely.

Strong beef-tea is by no means a good food for the average typhoid patient, and when given with sweet port wine it probably forms a mixture most prone to excite septic changes in the intestinal canal. As the patient needs a large quantity of water, there is absolutely not the smallest excuse for giving these *concentrated* meat extracts. It is far better to give weak broths and light, clear, and dilute soups.

The blood in typhoid—at any rate during the height of the fever—is poor in water, and the free supply of pure water to the patient is an urgent duty. It may be given, if preferred, in the form of barley-water (iced if the temperature is high), and this contains a small amount of carbohydrate. It has been calculated that at least 80 ounces of water should be taken by the fever patient in 24 hours, or about 3 to 4 ounces every hour. As, however, his food will be all fluid, we may include it in the estimate. Food and drink (of which quite one-half must be pure water) should amount to about 4 pints in the 24 hours. In *severe* cases, during the day, from 8 a.m. to 10 p.m., food or drink should be given every hour—drink one hour and fluid food the next—about 4 ounces each time. This will consume 60 ounces, or 3 pints. The remaining pint should be given at convenient intervals through the night. Two to 3 pints of milk, or the equivalent of 2 to 3 pints of milk, will be an adequate allowance for most cases, and 2 pints of barley-water may at the same time be given.* If milk, however treated, disagrees, as it will with some cases, and curd of milk is found in the motions, it will be best to convert the milk into *whey*. This can readily be done by boiling each pint of milk with a tablespoonful or two of lemon-juice and straining through muslin, strongly expressing all that can be expressed from the curd. Or we may try whether diluted peptonised milk is well tolerated. If we use whey, then we can easily supply the albuminous constituent, which we lose in the curd, by beating up a new-laid egg with two teaspoonfuls of brandy, and then adding 3 or 4 ounces of whey and straining. Two or three eggs may be given thus prepared in the day. Little other food than this is needed during the febrile period and before the period of exhaustion sets in. There can be no objection, however, to either of the following supplementary fluid foods and drinks in ordinary cases:—Light beef-tea, veal or chicken broth, clear consommé, peptonised gruel (strained), peptonised beef, chicken or milk jelly (made by adding a little isinglass to hot peptonised milk), calf's-foot jelly, butter-milk, albumen-water (made by mixing white of egg with twice as much water and straining—this is a good vehicle for alcoholic stimulants when they are needed), small quantities of tea, coffee or cocoa occasionally, home-made lemonade, orange and other fruit juice with water, iced champagne and seltzer water if the stomach is irritable; and for relieving the dryness of the mouth and throat a drink may be made of hydrochloric acid lemonade thus: 20 minims of dilute hydrochloric acid, two teaspoonfuls of glycerine, and a tablespoonful of syrup of lemons to a pint of water.

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* Sir William Jenner has pointed out that "a pint of milk contains as much solid animal matter as a full-sized mutton chop," and he has protested against the practice of giving large quantities of milk to typhoid patients (*Lancet*, vol. ii., 1879).

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* If there should be much intestinal catarrh and diarrhœa, or if hæmorrhage has occurred, we have found it best to give, for a time, much smaller quantities of food, so that the intestine may not be irritated by the constant passage of food through it.

With regard to the administration of **stimulants** in typhoid, we do not approve of their *routine* use. Cases of moderate severity in young people do exceedingly well without any alcohol; indeed, we regard alcohol, in cases of moderate severity, as of far more use during convalescence than during the fever. There are very few cases that are not the better for a glass or two of port wine daily during the early part of convalescence.

We should not give alcohol in the early stages unless some decided indication arises for its use, and we should begin with small quantities: 2 to 4 ounces of whisky or brandy, well diluted, in the twenty-four hours—*i.e.* a dessert- to a table-spoonful every three hours. Larger quantities may be needed when signs of great exhaustion appear, such as a weak, irregular pulse, feeble cardiac first sound, a dry, brown, tremulous tongue, sinking in the bed, muttering delirium, or a low, somnolent mental condition, with motions and urine passed unconsciously. As a rule, the older the patient the greater and earlier will be the need of stimulants.

Restlessness and sleeplessness at night will sometimes be relieved by a full dose (1½ to 2 ounces) of brandy or whisky given with the food. We have seen an ounce of brandy send a convalescent, sleepless patient to sleep in a few minutes. The spirits we use should be quite pure. Whisky and brandy are the best stimulants *during* the fever, port wine and champagne during convalescence.

We will next consider the **special** indication in the treatment of typhoid, and also the treatment of certain symptoms and complications. We have shown elsewhere* that the idea of an **antiseptic** or **disinfectant** treatment of typhoid fever has long been in the minds of practical physicians, and is to be found in the writings of Murchison, Watson, Jenner, and others. What is known of the conditions prevailing in the intestines and bladder in typhoid fever seems to point to the necessity of adopting a method of treatment which will include, as an essential part of it, an attempt to realise **intestinal** and **vesical disinfection,** so far as is practicable and safe.

The influence of the specific infective bacillus in setting up serious structural changes, often leading to fatal consequences, in a certain portion of the small intestine, is well known; and it seems probable that these consequences may be contributed to, in a notable degree, by a loss of power of resistance, in the specifically diseased tissues, to the attack of *non-specific* putrefactive micro-organisms which are always present in abundance in the intestinal canal and may under the conditions we are considering assume extreme virulence; so that intestinal *disinfection* may be more needed to counteract the local injurious influence of non-specific than of specific micro-organisms. We also know that the activity of the typhoid bacillus is not limited to the intestine, but that it exists in the blood and other organs. If an antiseptic action could be safely exercised on the blood or its bactericidal power increased, it would certainly be a rational indication.

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* "The Treatment of Typhoid Fever, especially by Antiseptic Remedies" (second edition). Cassell & Co. 1892.

What means have we at our disposal for the purpose of carrying out these indications?

The chief antiseptic or disinfecting agents that have been used in the treatment of typhoid are the following:—Quinine, chlorine, iodine, iodoform, *urotropine*, calomel, corrosive sublimate, carbolic acid, creasote, guaiacol carbonate, the sulphocarbolates, sulphurous acid and the hyposulphites, perchloride of iron, salicylic acid, salol, boric acid, turpentine, oil of eucalyptus, thymol, camphor, the naphthols and naphthaline, resorcine, bismuth salicylate, sulphide of carbon, tannin, charcoal, etc.

We shall first describe the method in which, from prolonged practical experience, we have been led to place most confidence, and then briefly refer to others which have most evidence in their favour.

We have found, as Watson and Murchison did many years ago, that of all disinfecting remedies **free chlorine** is one of the most efficacious. "I have repeatedly found it," says Murchison, "to have a beneficial influence upon the abdominal symptoms." We use a solution made in the following manner:—Into a 12-ounce bottle put 30 grains of powdered potassic chlorate, and pour on it 60 minims of strong hydrochloric acid. Chlorine gas is at once liberated. Fit a cork into the mouth of the bottle and keep it closed until it has become filled with the greenish-yellow gas. To hasten this you must keep shaking the mixture of acid and chlorate, and you may also stand the bottle in hot water. Then pour water into the bottle, little by little, closing the bottle, and well shaking, at each addition, until the bottle is filled. You will then have a solution of free chlorine, together with some undecomposed chlorate of potash and hydrochloric acid, and probably one or two bye-products.

If the bottle is filled too rapidly with water, the chlorine will be driven out of the bottle by the water instead of being dissolved in it.

To 12 ounces of this solution, for an adult, we add 24 to 36 grains of quinine and an ounce of syrup of lemons, and we give half an ounce to an ounce every two, three, or four hours, according to the severity of the case and the age of the patient.

Smaller doses must be given to young children, and the mixture may be further diluted with water if it is found too pungent. We have prescribed this mixture for many years in a great number of cases of typhoid fever in hospital and private practice, except in those mild cases in which there is obviously but little general infection, and which really need little other treatment beyond careful nursing and feeding.

In giving this mixture to a typhoid fever patient, one of the first results you will notice is a remarkable cleaning of the tongue. You will scarcely ever find a dirty, thickly-coated tongue in a patient who has been *early* put on this mixture. Too frequently, however, cases are admitted into our general hospitals after many precious days have been lost, and the patient's chances of recovery are seriously imperilled by this delay. Another most important change has been noticed again and again and reported to us by the nursing sisters in our hospital : it is that the fœtor of the evacuations, which has often been very offensive, will usually disappear within twenty-four to forty-eight hours of the commencement of this treatment.

We might expect that this mixture would be wholly absorbed in the stomach, and that it would not reach directly the lower part of the small intestine. But, no doubt, stomach absorption is much impaired in these cases, and some of this mixture seems to pass on, in great part unabsorbed, into the small intestine, for the hospital sisters report in certain cases a distinct odour of chlorine in the stools. But much of this mixture is, no doubt, absorbed into the blood, and in this way we not only obtain *intestinal* but also a certain amount of *general disinfection*.

Those who have objected to the use of **quinine** in typhoid fever have only objected to the enormous doses which have been advocated by some physicians —doses capable of producing toxic effects. We have never given such doses, nor have we ever found it necessary to exceed the very moderate doses we have here mentioned. We may state, in this connection, that we have found the efficacy of quinine in febrile states very much influenced by its mode of administration, and we have especially noticed this in giving quinine in pneumonias and in influenza. If we prescribe the quinine dissolved in citric acid, and given in effervescence by adding it to an alkaline mixture, doses of 2 or 3 grains will often be found to exert a powerful antipyretic influence, far greater than that obtained by the same quantity of quinine given in the dry state.

We consider this observation as to the action of quinine important, because we have seen reason to believe that, in infective fevers, if quinine be given in saline solutions, it is an active and reliable *anti-toxin.*

It is an error to suppose that *very large* doses of quinine are needed in such cases.

The following good effects have appeared to us to frequently follow this *antiseptic* or *disinfectant* method, and we have published the particulars of cases so treated elsewhere.*

1. A modification and sustained depression of the febrile temperature. 2. An abbreviation of the average course of the fever. 3. A remarkable maintenance of the physical strength and intellectual clearness of the patient, so that there has been far less need of stimulants. 4. A greater power of assimilating food. 5. A remarkable cleaning of the tongue. 6. A deodorisation of the evacuations. 7. A more rapid and complete convalescence.†

In short, it seems to exert an *anti-toxic* influence in many cases. But cases will be encountered which are not influenced favourably by this treatment, especially those which come under treatment *late* and those in which constipation is a prominent symptom.

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* "The Treatment of Typhoid Fever" (Cassell & Company). Also, "The Management of Fevers, and Particularly of Typhoid or Enteric Fever" (*American Journal of the Medical Sciences*, June, 1894).

† Since the publication of the first edition of this work many correspondents, at home and abroad, have written corroborating these statements from their own experience.

We are disposed to refer the effect on the temperature to the influence the chlorine and quinine exert on the activities of the infective organisms, or on the results of these activities; for, unlike the effect of mere antipyretics, the temperature does not fall immediately; it usually takes about forty-eight hours before this treatment notably affects the temperature.

The free hydrochloric acid in this mixture is also of undoubted value. It is an antiseptic, and an acid condition of the intestinal contents is hostile to bacterial life. Bouchard thinks, as we do, that quinine acts as a *general* antiseptic, and it has indeed been found to check the culture of the typhoid bacillus. Grancher has tested its effects, especially in typhoid in children, and has found them "remarkable"; and he also believes it to have a specific antiseptic action in this disease. Curschmann* says he "still prefers quinine" to other antipyretics in typhoid; and Liebermeister, Voit, Pécholier, and many others, have borne testimony to the value of quinine in this disease.

The antiseptic action of **calomel**, which has been given by many physicians in cases that are seen at the very onset of the disease, is in part due to its direct bactericidal effects, and in part to its purgative action, sweeping the intestine clean of decomposing ingesta and of putrefactive bacteria. Liebermeister gave calomel to every case that came under treatment before the ninth day of the fever—a dose of 8 grains three or four times in the first twenty-four hours—and he found he had better results than before. He found that it shortened the duration and lessened the intensity of the disease. If we see cases of typhoid quite early, and if there is no marked abdominal tenderness and diarrhœa, it is as well to begin the treatment with one or two full doses of calomel (3 to 5 grains), for, by clearing out the bowels thoroughly at first before the intestinal lesions have made any progress, it will be much easier to maintain intestinal antisepsis afterwards, especially if we avoid irrational and injurious over-feeding; and we shall have less hesitation, in a more advanced stage, in keeping the bowels absolutely at rest, as is positively necessary when certain complications threaten. It has been said that "purgation and antisepsis are, to some extent, interchangeable terms." An aperient expels the toxic ptomaines and other decomposing substances from the intestinal canal, and, if given in quite the early stage, may actually prevent subsequent serious diarrhœa.

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* Nothnagel's "Encyclopædia of Practical Medicine," art. "Typhoid Fever" (English edition), p. 461.

But the use of aperients, to be perfectly safe, must be limited to the first few days of the fever. Indeed, unless constipation is a prominent feature, we would limit their use to the initial cleansing of the bowel; for *rest* of the inflamed intestine is also an important condition of safety. The great risk in giving aperients in the latter stages is the possibility of the existence of deep ulceration in the ileum; and in that case, as Sir William Jenner has pointed out, an aperient may mean the difference between life and death to the patient. At that period of the disease intestinal antisepsis can only be safely secured by the use of other intestinal antiseptics.

Very brilliant results were obtained by Dr. Wilks, of Ashford, during a severe outbreak of typhoid, by the use of *sulphurous acid.** He gave the acid in doses of 3 to 20 minims, according to the age of the patient, every four hours, for a week or ten days or longer; the larger dose for adults. "Of the 171 cases who took sulphurous acid, not one lost his life, and there were few who were not convalescent within fifteen days of commencing the treatment."

Bouchard, whose criterion of an intestinal antiseptic is insolubility, so that it may not exert any toxic or irritant action on the stomach, or be absorbed there, commends β-naphthol for this purpose, reduced to a fine powder, and mixed with *salicylate of bismuth.* One hundred and fifty grains of β-naphthol are mixed with 75 grains of salicylate of bismuth, and this is divided into thirty powders. From three to twelve of these are given in the twenty-four hours, enclosed in a wafer and swallowed with the food. The β-naphthol has the advantage of being very slightly soluble in water, but it is a powerful antiseptic; it therefore reaches the intestine, where it acts as an intestinal disinfectant.

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* Published in the *British Medical Journal* so long ago as 1870.

M. Maximovitch recommends α-naphthol as preferable to β-naphthol. It is three times less toxic; and as to its antiseptic value, he found 1 part in 10,000 would prevent the development of the typhoid bacillus, as well as that of many other septic microbes in ordinary cultivation fluids.

Dr. Teissier, of Lyons, also prefers α-naphthol for producing intestinal antisepsis in typhoid fever. He gives it in 6-grain doses, combined with salicylate of bismuth, and he at the same time promotes free diuresis by cold water enemata. He considers that the naphthol acts by sterilising the bacterial products in the intestine.

Thymol is preferred by some; it is innocuous in full doses, and possesses an antiseptic power four times as great as that of carbolic acid. It is insoluble, so that it is certain to reach the small intestine.

It may be given in doses of 2 to 3 grains every three hours, made into a pill with soap powder and a little spirit, and these should always be given with the food.

Pure carbolic acid was warmly advocated by the late Professor Charteris in the treatment of typhoid. Surgeon-Lieutenant-Colonel Quill * has used, in India, a combination of *carbolic acid and chloroform* in the treatment of enteric fever, and he writes enthusiastically of the results he and others have obtained from this method, combined with great care in feeding. The mixture he prescribes consists of 36 minims of Calvert's *pure* carbolic acid, 2 drams of spirit of chloroform, 3 drams of compound tincture of cardamoms, 2 ounces of syrup of hemidesmus, and chloroform water to 12 ounces. Of this he gives an ounce, with an equal quantity of iced water, every second hour, for five doses on the first day, for seven doses on the second day, and for ten or twelve doses on the third and following days. When the temperature has fallen and the general condition of the patient has improved, the doses are gradually diminished in frequency, but not wholly discontinued, until the temperature has been normal for a week. "One patient," he says, "took from first to last over 2 ounces of carbolic acid, with the same quantity of chloroform," without the manifestation of any toxic symptoms. He considers the doses given by other practitioners have generally been too small; "to be effectual the acid must be given in full doses at short intervals."

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* *British Medical Journal*, April 28th, 1894.

Carbonate of guaiacol has been given by Hölscher, of Mülheim, in doses of 15 to 30 grains, twice a day, and he states that sixty cases have been so treated without a death.

Turpentine is recommended by H. C. Wood as of especial value about the end of the second week, when there are signs of progressing intestinal ulcerations. His formula will be found at the end of the chapter. He considers its volatility a great recommendation, as the ulcerated surface is bathed by the antiseptic vapour.

Salol has been given largely as an intestinal antiseptic, but we have not found it of use in these cases. *Oil of eucalyptus* has been prescribed with remarkable results by Kesteven, of Brisbane; *camphor* by Janaway, of New York; *creasote* by Pécholier, of Montpellier; *sulphide of carbon* water by Dujardin-Beaumetz; and perchloride of mercury by other practitioners.

In all these instances the idea and the indication have been the same, and the good results reported are almost identical with those we have tabulated as derived from the chlorine and quinine treatment, which we still prefer. If we had to select, from the other antiseptic agents referred to, the most suitable drugs for the purpose, we should choose thymol, pure creasote, and in some cases turpentine.

A further example of the value and need of *disinfectant* treatment in typhoid fever has been afforded by the recent observations on the urine in typhoid fever by Richardson and Horton Smith. They have shown that in about five-and-twenty per cent. of the cases they investigated the urine was found to be highly infective and dangerous from the presence of typhoid bacilli, sometimes in enormous numbers sufficient to render the urine *turbid!* This turbid urine gives a "curious shimmer" in the test tube, which Horton Smith thinks characteristic. In about one-half the cases this *bacilluria* was accompanied by cystitis and pyuria. This condition of the urine was found to be rarely present before the third week, and sometimes did not appear until the early days of convalescence; it is therefore especially associated with the later stages of the disease. Its tendency to persist for a long time (twenty-one to seventy days) renders it particularly dangerous as a means of spreading the disease. It has even been known to persist for years. Its occurrence should be suspected if the urine suddenly becomes turbid and manifests the "shimmer phenomenon," or if pyuria arises. It is difficult to say what gives rise to this bacilluria. Horton Smith suggests that a stray micro-organism finds its way to the bladder, from the blood, after passage through the kidney, and that, in certain conditions of the bladder and urine, it undergoes rapid multiplication. It seems to be analogous to the *cholecystitis* which sometimes arises as a complication or sequel of typhoid, and is known to be associated with the presence of a large number of bacilli in the gall-bladder. But what interests us especially, in this place, is the emphasis and stress which these observations give to the necessity, from many points of view, of promoting the idea of an antiseptic or disinfectant treatment of this disease. *Urotropine* is the antiseptic that has been found especially efficacious in curing the bacilluria. This drug is prepared by the action of ammonia on formic aldehyde, and it is believed to act by the liberation of *formalin* after its passage into the urine. Typhoid bacilli rapidly disappear from the urine when urotropine is given in 10-grain doses thrice daily. The turbid urine becomes quite clear in twenty-four hours, and a permanent cure is effected in a few days, although it is as well to continue the treatment for a week. Horton Smith, following the proposal of Richardson, suggests, as bacilluria may exist without giving rise to any symptoms, that urotropine should be given in *all* cases of typhoid fever, from its onset through its whole course, and during the first three weeks of convalescence, as in these doses the drug, he considers, produces no ill effects. But we have known it excite great bladder distress and irritation in some persons, and we hardly think it needful to give it for so long a period, more especially if such antiseptic treatment as we have suggested is carried out. When this has been the case, we have never encountered any symptoms of pyuria or cystitis at any time in the course of the fever or during convalescence, and further observations will probably disclose the fact that the pursuance of rational *disinfectant* methods will lead to the avoidance of bacilluria.

Many of the milder cases, as we have already said, need no treatment beyond rest in bed and a careful diet; but by way of precaution we should begin by giving a mild calomel and saline purge, and three or four doses of the quinine and chlorine mixture daily; and, even in the mildest cases, this treatment will often be found to shorten the attack and promote early convalescence; but as some patients, who scarcely feel at all ill, object to the taste of the chlorine mixture, it may, in such cases, be replaced by a grain or two of quinine given in hydrochloric acid lemonade.

We have still to consider the treatment of typhoid fever by **hydrotherapy,** and also the treatment of certain *complications*, such as high temperature, severe diarrhœa, hæmorrhage, perforation, etc.

With regard to the treatment of **high temperature,** we think it an error to regard the elevation of temperature in typhoid as a thing to be attacked as if it were itself the disease; it is but a sign of the intensity of the activities of the infective agent, or of individual sensitiveness to them, and we rejoice to see the temperature fall as a result of our treatment because we believe that we have lessened the virulence of the infection. We have attacked the cause, and the effect is weakened. But there is small ground for rejoicing over the effect of large doses of a depressing antipyretic which may lower the temperature several degrees for a few hours, only that it may rise again, unless we re-administer the antipyretic in doses which are often really toxic. We therefore discard altogether the *depressing antipyretics*, or limit their use to certain cases of hyperpyrexia, when we may be precluded from the application of other and safer depressors of temperature. But unless the temperature keeps above 104° F., and the patient's general condition seems unfavourably affected thereby, we do not see any urgent indication for directing our treatment especially to the reduction of the temperature. But when the temperature keeps above 104° F., with but slight morning remissions, and our antiseptic measures fail in reducing it, we should certainly adopt some means of lowering the temperature, as in itself an injurious symptom; but it must be remembered that some patients present a temperature reaction much in excess of that of others without being as severely attacked, and we have often seen young patients with a temperature ranging between 103° and 104° F. who have shown little other signs of illness.

But it is to the use of cold baths as a *routine* method of treatment that we would now refer. The following is the plan adopted, according to the directions of one of its warmest advocates. When the temperature rises above 102·5° F. a bath at 70° F. is given every third hour. "The patient remains in the tub for fifteen or twenty minutes, is taken out, wrapped in a dry sheet, and covered with a blanket. While in the tub the limbs and trunk are rubbed thoroughly, either with the hand or a suitable rubber. It is well to give the first one or two baths at a temperature of 75° to 80°. If the bath at 70° is not taken well, raise the temperature to 75° or 80°. . . . Food is usually given, sometimes a stimulant, after the bath. The blueness and shivering, which often follow the bath, are not serious features. The rectal temperature is taken immediately after the bath, and again three-quarters of an hour later."* The first reflection that must occur to physicians of experience is, that if this *routine* cold bathing is applied to every case which has a temperature of over 102·5°, it is absolutely certain that it is not needed in a very large proportion of the cases so treated. In very many of the mild cases the temperature touches 103°, and to put all these into a cold bath, without exception, must appear to every thoughtful mind as irrational a proceeding as has ever been practised. Let cold bathing, as a method of treating typhoid fever, stand for what it is worth, and let it be applied in cases that seem to demand it—but do not let us be induced to use it indiscriminately and as a matter of routine simply on the strength of certain statistics the value of which we have no opportunity of testing.† Moreover, we have ourselves known the most serious and fatal results follow this routine method of cold bathing when applied to highly sensitive, nervous patients; and it involves the maximum of fatigue to the patient and the maximum of trouble to the attendants, while we can conceive of no routine plan of treatment better calculated to induce serious complications in otherwise mild cases.

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* Osler's "Practice of Medicine" (fourth edition), p. 43.

† We are not fond of relying exclusively on the argument from statistics, but Dr. O'Connor, of Buenos Ayres, states that he has applied the method of treatment described at p. 674 in 100 consecutive cases of typhoid fever, and has only had two deaths. No results so good as this have been obtained with the *cold bath* treatment.

But if, in order to combat the pyrexia, we wish to apply cold to the surface, we can do so in an effective manner without having recourse to the cold bath. The patient can be enveloped in a cold wet sheet for a minute or two, then rubbed over with dry towels; and when there are two beds, side by side, this is easily carried out. Or the surface of the body may be rapidly cooled by quickly and repeatedly passing over it a large smooth piece of ice enveloped in thin flannel, or a large sponge wrung out in ice-cold water, the patient being turned over on his side while it is being applied to the back, when it should be passed several times along the spine. Also an ice-bag may be applied to the back of the neck, and another to the head. A few ounces of ice-cold water may also be injected into the rectum from time to time. All these are useful measures for reducing hyperpyrexia and the nervous excitement and exhaustion connected therewith.

Dr. Fenwick has suggested a method of cooling the air around the patient by covering him with a cradle, which keeps off the bed-clothes, and suspending small zinc buckets filled with ice from the cross-bars of the cradle.

Although the routine cold bath method of treatment is at present widely advocated, we are by no means alone in condemning it as a *routine* treatment. Professor S. Smith Burt, of New York,* remarks with regard to the tub bath, "Anything that puts such a strain upon a patient as to require free stimulation in consequence had better not be employed indiscriminately. A sponge bath of one-third alcohol and two-thirds cold water thoroughly carried out . . . will accomplish the desired result with considerably less expenditure of strength on the part of the patient."

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* *Medical News*, October 20th, 1900.

Professor H. A. Hare * says, "I am opposed most strongly to the indiscriminate application of the cold plunge or Brand bath to every patient suffering from this malady. . . . It is, or ought to be, a fundamental law of therapeutics that there is no such thing as treatment by hard-and-fast rules of routine. The recommendation that all cases of typhoid fever with a temperature of 102° to 102·5° shall be placed in a tub of water at 65° to 70° is an affront to this rational law." In an elaborate estimate of the effects of the *plunge bath* he concludes that it causes (1) an unnecessary expenditure of the patient's strength, (2) an increased tendency to hæmorrhage, (3) the more frequent occurrence of relapses, (4) probably a prolongation of the duration of the disease, and (5) albuminuria in a large percentage of the cases.

Curschmann, although an advocate of "lukewarm" baths, is not in favour of their *routine* use. "Cases of severe onset," he says, "with symptoms of intense persistent intoxication, should from the outset be subjected to bath treatment . . . the conditions are different with regard to the mild or moderately severe cases. *These may not require the bath treatment;* diet, rest, and the systematic regulation of the remaining conditions are here generally quite sufficient. . . . In all cases of typhoid fever I have given daily one, possibly two, *cool or tepid spongings*, which are refreshing, and exert a favourable influence upon the nervous system." Most emphatic is his statement of the cases in which hydrotherapy is *contra-indicated.* "Every form of bathing treatment is strictly forbidden on the appearance of the first sign of intestinal hæmorrhage, as well as on the appearance of even the slightest degree of peritonitic irritation. The method is also dangerous in patients with weakness of the heart . . . also persons with arterio-sclerosis . . . pleuritic effusions . . . phlebitis . . . severe laryngeal lesions . . . old age, even persons between 40 and 50 . . . children bear very cold baths even worse than adults . . . chlorotic and in general anæmic debilitated individuals . . . obese persons; even in youthful persons of this character, particularly in 'blooming, thriving' young women, unfortunate experiences are not rarely encountered. . . . The great tendency to cardiac weakness often renders the baths dangerous also for alcoholics."* He also testifies that "furunculosis of the skin appears to occur with especial frequency at times when typhoid fever is vigorously treated with frequently repeated and exceedingly cold baths. Since I have abandoned this mode of treatment furunculosis has become less common among my patients."

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* "System of Practical Therapeutics" (second edition), vol. ii., p. 40.

When the temperature keeps persistently high we do not object to a few doses of phenacetin, the safest of the depressors of temperature, given in combination with quinine. We give quite small doses, but we have found them act well—2 grains of phenacetin with 1 grain of hydrobromate of quinine every hour until the temperature has fallen two or three degrees, then every two or three hours.

Next as to the treatment of **diarrhœa.** If we have followed the principles of intestinal disinfection already set forth; if we have commenced by sweeping the intestine clean by calomel or some other simple aperient, if we have cautiously regulated the diet so that no accumulations of food could possibly linger in the intestine to undergo fermentation and cause irritation from its presence; and if, notwithstanding, diarrhœa continues or arises, and is attended with abdominal tenderness and tympanites; and if on inspection we find the evacuations fluid and quite free from curd of milk or other undigested food, then we may conclude that it is due to the intensity of the ulcerative and catarrhal processes set up in the small intestine, and that the indication is to arrest it and keep the intestines as completely at rest as possible. Nothing does this so well as opium, and no mode of giving opium is so suitable as small enemata. We also prefer solid opium, which is absorbed slowly, to any liquid form, which is absorbed too quickly, and will, if a full dose be given, sometimes act unfavourably on the heart and nervous system. We give 5 grains of Dover's powder and 10 grains of tannin mixed with an ounce of gum mucilage, and we order this to be mixed with 1 or 2 ounces of warm water, arrowroot, or thin starch, and to be injected into the bowel with a long tube (8 or 10 inches in length) after each motion. For children we reduce the quantity of Dover's powder. Internally we should give salicylate of bismuth, 5 grains, with carbonate of bismuth, 5 grains, mixed up with a little mucilage and cinnamon water, and this may be given every three hours until the diarrhœa is relieved. Other remedies for this symptom will be found in the appended formulæ.

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* Nothnagel's "Encyclopædia of Practical Medicine," art. "Typhoid Fever" (English translation), p. 458.

If there is much tympanites and abdominal tenderness, a flannel sprinkled with a mixture of equal parts of opium and turpentine liniment should be kept applied to the abdominal surface. The careful passage of a rectal tube is occasionally needed to relieve excessive distension brought on by unsuitable and excessive feeding.

Hæmorrhage is a very serious symptom, and calls for prompt measures for its arrest; its occurrence is often indicated by a sudden fall of temperature. No treatment is so serviceable as the arrest of all intestinal movement. We must do our best to keep the intestine absolutely at rest. We have been able to keep the bowels inactive and completely at rest for more than fourteen days in order to avoid the danger attending a recurrence of serious hæmorrhage and then we have only allowed the bowels to act after an enema of olive oil.

On the occurrence of hæmorrhage we use immediately the enema of Dover's powder and tannin we have just referred to, but we increase the dose of Dover's powder to 10 grains. Indeed, in all cases of typhoid we usually order such enemata to be kept ready at hand, to be administered immediately if hæmorrhage occurs. We are satisfied that lives have been saved by this precaution. At the same time we order the following mixture by the mouth :—

℞ Acidi gallici	gr. lx.
Alcohol	℥j.
Solve et adde—	
Acidi sulphurici aromatici	♏xl.
Glycerini	ʒiij.
Liquoris opii sedativi	♏xv.
Aquæ cinnamomi ... ... ad	℥vj.

Misce, fiat mistura. Two tablespoonfuls every hour for six doses, and then every three hours.

We allow no food that can leave any unabsorbed residue, and all food should be given cold, and we allay thirst by means of small quantities of iced water. A soft, broad flannel binder applied firmly, but not tightly, round the abdomen no doubt helps to keep the intestines at rest and still. Ergotine may be injected hypodermically, but we should prefer to trust to the measures we have described.

In protracted hæmorrhage we have found turpentine very useful—two capsules of 3 minims each every four hours. It has the advantage of being both styptic and antiseptic.

Perforation *of the intestine,* indicated by sudden very severe pain, collapse, fall of temperature, and signs of peritonitis, requires immediate recourse to operative measures. This offers almost the only chance of recovery. Laparotomy should be performed, the opening in the bowel found and closed, and the peritoneum flushed with sterilised water or some mild antiseptic fluid. The earlier the operation is performed the better are the results to be expected. Cushing[*] has performed this operation under local cocaine anæsthesia. He has collected thirty-five cases of recovery after operation. According to the statistics collected by W. W. Keen, the highest rate of mortality occurs between the ages of 15 and 25—the highest rate of recoveries (53·84 per cent.) under 15 years of age and over 35 (30 per cent.).[†] An important aid to diagnosis of this complication is said to be an increase in leucocytosis. If, for any reason, operation is not practicable, full doses of opium (or morphine hypodermically) should be given to lessen the effects of shock and relieve the extreme suffering.

In addition to the special dangers of hæmorrhage and perforation in the advanced stages of this disease, one of the most serious conditions affecting the safety of the patient which arise at that period is progressive *heart failure* with *hypostatic congestion of the lungs.* This condition may require to be dealt with by energetic and sustained stimulating and tonic measures. Alcohol must be given freely, but with judgment, and it must be remembered that the alcohol we administer has to be eliminated, and that the organs of elimination are not in the best state for the due performance of their functions. We prefer small and frequent doses rather than large quantities at a time, and we mix them with other cardiac stimulants, such as a strong and fresh infusion of coffee, which is too little used in such circumstances. Strychnine, given hypodermically, is one of our best resources in these cases of cardiac asthenia; beginning with doses of $\frac{1}{60}$th of a grain we may increase them rapidly, if necessary, up to $\frac{1}{16}$ grain every four to six hours. Caffeine is also a valuable cardiac stimulant at such times, and it also is best given hypodermically. Five grains, dissolved by the aid of 5 grains of sodium benzoate in 20 minims of warm distilled water, may be injected three or four times a day if needful. Hypodermic injections of ether or of ethereal solutions of camphor (Curschmann prefers solutions of camphor in olive oil) have also long been used for the same purpose. Digitalis is recommended by some physicians, but we prefer caffeine and strychnine as cardiac stimulants at such times.

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[*] *Philadelphia Medical Journal,* March 3rd, 1900; and *Annals of Surgery,* May, 1901, p. 544.

[†] Hare's "System of Practical Therapeutics" (second edition), vol. ii., p. 68.

Nervous symptoms, as delirium, insomnia, restlessness, etc., are, as we have already pointed out, usually associated with hyperpyrexia or a sustained high temperature, and they must be met by such measures for lowering the temperature as we have described. But when typhoid fever attacks persons of neurotic temperament we may find, from the first, that nervous disturbances manifest themselves independently of high temperatures; such patients require sedatives to quiet nervous excitability. Opium has been objected to in such cases on the ground that it favours cerebral congestion, and chloral with potassium bromide at night to relieve restlessness and insomnia has been preferred. We make no objection to the chloral and bromide, but no drug quiets the constitutional nervous unrest like opium. A draught may be given at night containing 10 to 20 minims of liquor opii sedativus with 30 minims of spirits of nitrous ether and 30 minims of sal volatile in an ounce of camphor water. We have, however, at times seen opium, given for this purpose, appear to cause a rise of temperature, possibly by checking elimination. We have then given with advantage a draught containing 15 grains of sodium bromide and 20 minims of tincture of henbane in an ounce of camphor water.

Careful nursing and cleanliness will prevent the occurrence of **bed-sores.** In protracted cases, in addition to sponging the back frequently with cold water and thoroughly drying, the application twice a day to the prominent parts of a lotion of rectified spirits with 10 grains of tannin to the ounce is a good precautionary measure.

The stage of **convalescence** in typhoid requires the most careful watching. Bearing in mind the anatomical intestinal lesions characteristic of this disease, we shall realise the fact that, for some time after the cessation of the fever, there may be only a thin layer of peritoneum between life and death to the patient. It is this *hurt* intestine that we have to think of; and it is best to be frank with the patient's friends and explain to them without any mystery the real state of the case. The craving for solid food must therefore be steadily resisted, and for ten or twelve days after the temperature has become normal no solid food should be given. The rise of temperature, which is often excited during convalescence by solid food or by even too much liquid food, is sometimes spoken of as a mysterious thing; it has been termed "febris carnis" and "febris cibi." We believe the true explanation to be that if food is given leaving much fæcal residue, the ordinary fæcal toxins will be formed, and these will be readily absorbed by the yet unhealed, or incompletely healed, ulcerated intestinal surface, and a rise of temperature will follow. The same will sometimes occur, and for the same reason, if constipation is allowed to go on, unrelieved, during convalescence; and we have often shown, in cases in the hospital, that the administration of an enema of soap and water and olive oil, after it has produced an action of the bowels, is at once followed by a fall of the temperature to normal. We are therefore in the habit of securing a daily action of the bowels by such an emollient enema. Should some tendency to diarrhœa continue into the convalescent period, from a lingering intestinal catarrh, it should be checked by bismuth, the carbonate or salicylate. Nothing promotes rapid convalescence and return of strength so much as reclining for many hours a day in the open air—of course, in favourable weather. Some stimulant is usually needed during convalescence, and good, sound port wine is the best.

The treatment of *relapses* must be conducted on the same principles as that of the original attack. They probably arise from re-infection by bacilli within the body, as, for instance, in the gall-bladder, the patient not having been rendered immune by the attack.

TYPHUS FEVER.

Cases of typhus fever are now rarely seen in England, either in *general* hospitals or in private practice; we shall therefore deal briefly with this subject. The specific germ of typhus has not yet been discovered, although several micro-organisms have been described as associated with it, and as the disease seems to be disappearing before the improved sanitary conditions now so generally enforced, there is perhaps less chance of an early discovery of the actual specific infective germ. Typhus fever is one of the most contagious diseases, resembling in that respect the acute exanthemata. It spreads by direct contact from the sick to the sound, and has, in former times, proved a very fatal disease to the physicians and nurses engaged in attending its victims. The poison adheres tenaciously to articles which have been in contact with the patients (fomites), and seems to be given off in the breath and exhaled from the skin. Overcrowding causes the poison to acquire great virulence, while free ventilation greatly reduces the risk of infection. It is especially a disease of poverty, overcrowding, and defective ventilation and sanitation, and it used to be commonly met with in overcrowded, ill-cared-for dwellings, prisons, camps, and wherever human beings were crowded together in misery, want, and dirt. It used to be common in the jails of this country in the eighteenth century, and was known as "jail fever," and as recently as 1893 the overcrowded prisons in France were visited by an outbreak. It is a very fatal disease when it attacks those over middle age, but the mortality is low in those attacked under twenty.

The *incubation* period seems to vary with the intensity of the infection from a few hours to two or three weeks—twelve days is said to be the average.

The onset, unlike that of typhoid, is sudden, with rigors, headache, often very severe, and pains in the back and limbs and great depression. The temperature rises rapidly and may reach 104° the first night, and there are the usual symptoms of pyrexia—thirst, furred tongue, quickened pulse, flushed face, tremors, and tendency to early setting in of delirium. The temperature reaches its maximum on the fourteenth day (or night), and may rise to 106° F.; the morning remissions are less than in typhoid. There is usually *constipation*, and the urine is scanty, dense, and high coloured, with an excess of urea and uric acid and a diminution of chlorides, and it often contains albumen. The characteristic *rash* of typhus usually appears on the fourth or fifth day; it consists of two elements, "a fine, irregular, dusky-red mottling" and distinct papular rose spots, which change to petechiæ. These spots are permanent, and persist till the crisis, and do not come out, in successive crops, like the eruption in typhoid.

The delirium and restlessness are troublesome symptoms. The delirium is more commonly quiet and muttering, but may be noisy and violent. Symptoms of excitement pass, as the disease advances, into nervous depression, stupor, and extreme prostration. In cases that recover, usually on the fourteenth day, the temperature falls rapidly (by crisis), the patient passes into a deep sleep, and awakes free from fever, though extremely weak, and recovers rapidly. In fatal cases the patient dies in a state of coma about the fourteenth or fifteenth day, the temperature rising to 106° or higher. In milder cases with only slight nervous disturbance the crisis may occur on the twelfth day or earlier. Relapses are very rare, and one attack usually, but not invariably, protects from others. Serious complications and sequelæ are common—pulmonary congestion, lobular pneumonia, bronchitis, thrombosis of veins of lower limbs, embolism leading to gangrene, bed-sores, suppurative parotitis, and secondary abscesses.

This brief sketch of the usual course of typhus fever must serve as an introduction to the consideration of its **treatment.** The needful prophylactic measures will be obvious. Should a case of this disease be encountered, it must be isolated and dealt with on the principles we have already repeatedly referred to in the preceding chapters on infectious fevers.

The removal of those attacked to well-ventilated apartments or to suitable shelters in the *open air,* and the thorough disinfection of the places or buildings in which the fever has broken out, are of the utmost urgency. The nurses should be young, or selected from those who have been rendered *immune* by previous attack. The medical attendant should wear a special wrap when visiting these cases, and should avoid any unnecessarily close contact with the patient as well as breathing the atmosphere around his person and bed-coverings. Convalescents should be provided with new, or thoroughly disinfected, clothing, and must be regarded as infective for a month from the onset of the illness. They should have several disinfecting baths.

There is usually more urgency for early and active stimulation and supporting treatment in typhus than in typhoid, as this disease runs a much shorter course and usually terminates by crisis on the fourteenth day. We should give frequent small doses of quinine, in effervescence, or in solution in hydrobromic acid, from the beginning, and adopt such means of reducing hyperpyrexia as we have already dwelt upon. Acidulated water should be freely given to allay thirst, and for this purpose a drink made with syrup of lemons and dilute hydrochloric acid is most useful. A dram of the dilute acid and an ounce of the syrup may be added to a pint of water, and this may be drunk almost *ad libitum.* Head symptoms and delirium are far more common in typhus than in typhoid, and shaving the head and the constant application of an ice-cap are much more necessary. In the early days chloral and bromide of potassium may be given to procure sleep, which is an urgent indication; but later it is perhaps best to trust to full doses of alcohol for the purpose, as cardiac asthenia is then a serious complication. Graves gave opium combined with tartar emetic—four minims of tincture of opium with $\frac{1}{4}$ grain of tartar emetic in a tablespoonful of water every two hours until sleep is induced. If opium is contra-indicated, as when there is much pulmonary congestion, a hypodermic injection of $\frac{1}{200}$ grain of hyoscine may be safer.

Open-air treatment when practicable has been found very advantageous. Curschmann observes, "I cannot say too much in favour of the open-air treatment. . . . The patients became quiet, and the symptoms of the initial stage—the violent headache and insomnia—were more favourably influenced by the open-air treatment than by any other means," while it afforded "the most effectual means of guarding against the spread of the disease."* In the Lille-Paris epidemic of 1893 the mortality became greatly reduced by moving the patients into the garden and treating them in the open air.

For the great nervous prostration camphor (gr. iv.) and musk (gr. x.) has been prescribed with benefit. Hypodermic injections of strychnine and ether have been given in cases of collapse, and recourse may be had to all the measures we have repeatedly mentioned in previous chapters for maintaining the circulatory force. Curschmann speaks very highly of the hypodermic injection of full doses of camphor dissolved in olive oil—1 part of camphor to 5 parts of oil.

The *diet* may be more liberal than in typhoid, as we have no intestinal lesions to consider, but it will have to be limited, as in all acute pyrexias, by the tolerance and digestive capacity of the patients.

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* Nothnagel's "Encyclopædia of Practical Medicine" (English edition), art. "Typhus Fever," p. 615.

Milk, gruel, arrowroot, clear soups and broths, beaten-up eggs, beef juice, jellies, and other light nourishment may be given. Alcohol should not be administered as a matter of routine, but kept in reserve for use when serious symptoms of asthenia approach. The occurrence of bed-sores must be provided against as we have directed in cases of typhoid.

ADDITIONAL FORMULÆ.

Sulphurous acid mixture in typhoid.

℞ Acidi sulphurosi, ʒij.
Syrupi aurantii, ʒiv.
Aquæ ad ℥vj.
M. f. mist. Two tablespoonfuls every four hours (smaller doses for children). (*Wilks.*)

Turpentine mixture for typhoid.

℞ Olei terebinthinæ, ʒjss.
Olei caryophylli, guttæ vj.
Glycerini } āā ℥ss.
Mucilaginis acaciæ }
Syrupi et aquæ ad ℥iij.
M. f. mist. A dessertspoonful every two hours during the day. (*Prof. H. C. Wood.*)

Eucalyptus mixture in typhoid.

℞ Olei eucalypti, ♏v ad x.
Spiritus ammoniæ aromatici, ʒss.
Spiritus chloroformi, ʒss.
Glycerini, ʒss.
Mucilaginis et aquæ ad ℥j.
M. f. haust. To be taken every four hours. (*Kesteven.*)

Sulpho-carbonated water for typhoid.

℞ Carbonei bisulphidi, ʒvj.
Essentiæ menthæ piperitæ, ♏l.
Aquæ, ℥xvj.
Shake well in a large bottle, and allow the bisulphide of carbon to settle. Use only the clear watery solution, and renew the water as it is used. Eight to ten tablespoonfuls daily to be given in tablespoonful doses mixed with half a glass of milk. (*Dujardin-Beaumetz.*)

Iodine and carbolic acid mixture.

℞ Acidi carbolici, ♏xij.
Tincturæ iodi, ♏v.
Tincturæ aurantii, ʒjss.
Syrupi, ʒiij.
Aquæ ad ℥viij.
M. f. mist. Two tablespoonfuls every four hours. (*Grimshaw.*)

Diarrhœa mixture in typhoid.

℞ Plumbi acetatis, gr. ij.
Acidi aceti diluti, ♏xv ad xx.
Morphinæ acetatis, gr. $\frac{1}{8}$ ad $\frac{1}{4}$.
Aquæ destillatæ, ℥j.
M. f. haust. (*Osler.*)

Another.

℞ Acidi sulphurici aromatici, ʒiij.
Tincturæ opii, ʒjss.
Tincturæ catechu, ℥ij.
Aquæ chloroformi ad ℥x.
M. f. mist. Two tablespoonfuls three times a day, or after each liquid motion. (*Whitla.*)

Another.

℞ Extracti opii aquosi, gr. jss ad iij.
Mucilaginis et aquæ ad ℥vj.
M. f. mist. A tablespoonful every two hours. (*Bamberger.*)

For diarrhœa of typhoid.

℞ Bismuthi subnitratis, ʒj.
Morphinæ sulphatis, gr. j.
M. et div. in pulv. xij. One to four a day. (*Alonzo Clark.*)

For hæmorrhage in typhoid.

℞ Ergotini, gr. xij.
Syrupi limonis, ℥ss.
Aquæ destillatæ ad ℥iij.
M. f. mist. A tablespoonful every hour. (*Bamberger.*)

Powders for the same.

℞ Plumbi acetatis, gr. jss ad iij.
Opii pulveris, gr. j ad ijss.
Sacchari albi, gr. lx.
M. et divide in pulv. vj. A powder every three hours.

Or,

℞ Aluminis, ʒj.
Opii pulveris, gr. iv.
Sacchari albi, ʒij.
M. et divide in pulv. xij. One every three hours. (*Bamberger.*)

Mixture for the same.

℞ Acidi tannici, gr. x.
Tincturæ opii, ♏vj.
Spiritus terebinthinæ, ♏xv.
Mucilaginis, ʒij.
Tincturæ chloroformi compositæ, ♏xx.
Aquæ menthæ piperitæ ad ℥j.
M. f. haust. To be taken every two hours. (*Murchison.*)

Mixture for sleeplessness in typhoid.

℞ Liquoris morphinæ hydrochloridi, ʒj.
Sodii bromidi, gr. xlv.
Syrupi aurantii, ʒiij.
Aquæ chloroformi ad ℥ij.
M. f. mist. Half to be taken at bed-time, and the remainder in three hours, if necessary. (*Whitla.*)

Acid mixture in typhus.

℞ Acidi nitro-hydrochlorici, ʒss.
Spiritus ætheris nitrosi, ʒiv.
Aquæ camphoræ ad ℥vj.
M. f. mist. A tablespoonful every two or three hours. (*Hartshorne.*)

Stimulating mixture in typhus.

℞ Pulveris moschi, gr. x.
Mucilaginis acaciæ, ʒij.
Syrupi aurantii, ʒij.
Aquæ camphoræ, ℥ss.
M. f. haust. To be taken every five or six hours. (*Murchison.*)

Mixture for adynamic restlessness in typhoid.

℞ Liquoris opii sedativi, ʒss.
Spiritus ætheris, ʒj.
Aquæ camphoræ ad ℥iij.
M. f. mist. Two tablespoonfuls every hour until sleep is induced. (*Murchison.*)

Sedative mixture in typhus.

℞ Potassii bromidi, ʒiij.
Chloral hydratis, ʒj.
Aquæ ad ℥vj.
M. f. mist. A tablespoonful every two hours. (*Charteris.*)

Tonic mixture for convalescence in typhus.

℞ Quininæ sulphatis, ʒss.
Acidi nitro-hydrochlorici diluti, ʒiv.
Tincturæ calumbæ } āā ℥j.
Tincturæ quassiæ }
Infusi aurantii ad ℥viij.
M. f. mist. A tablespoonful in a wineglass of water three times a day before meals. (*Whitla.*)

CHAPTER V.

THE TREATMENT OF INFLUENZA; OF MALARIAL FEVERS; AND OF TETANUS.

INFLUENZA—Difficulties in its Investigation—Misleading Methods—Fatal Pulmonary Complications in the Feeble and Aged—The Avoidance of Serious After-effects of Chief Importance in Treatment—The Dangers of Trusting too much to Analgesic and Antithermic Drugs—Need of Tonics from the first—Quinine a real Anti-toxin—Cases—Many require no Drug Treatment—Certain Symptoms need Careful Management—Indications—To Antagonise a Bacillary Toxin—High Temperature, Headache, and Gastro-intestinal and Muscular Pains—Laryngo-tracheal Cough—Bronchitis and Pneumonia—Gastro-intestinal Catarrh—Cerebro-spinal Cases—Cardiac Asthenia—Some Remedies.

MALARIAL FEVERS—*The Plasmodium Malariæ*—Infection through Mosquitoes—Forms of Malarial Infection—Quinine the Specific Remedy—Various Modes of Administering Quinine—Management of the Attacks of Fever—The Intermittent, Remittent, and Pernicious Forms—Malarial Hæmoglobinuria—Malarial Cachexia—Prophylaxis.

TETANUS—A Bacillary Infection—Characteristic Symptoms—Treatment—Tetanus Anti-toxin.

Additional Formulæ.

INFLUENZA.

AN epidemic of **influenza**, which had not been known in Great Britain since 1847-48, re-entered England from the European continent at the end of 1889. It spread widely during the spring of 1890, was present in various parts of the country in the winter and spring of 1890-91, and at the end of the latter year and the commencement of 1892 assumed alarming proportions and was attended with great mortality. In December, 1893, it again appeared in a severe and widely-diffused form, and nearly every winter, or early spring, since then it has been more or less present.

Although the disease appeared in England at the end of 1889, it was not until the winter of 1891-92 that serious alarm began to be felt at its progress and its severity, and that due attention began to be paid to the gravity and variety of its **after-effects.** A disease which varies so greatly in its incidence on different persons, which arouses such a variety of morbid phenomena, in different organs, in those it attacks, and with regard to which the reaction of different constitutions, to its specific poison, is so varied, obviously presents special difficulties to the investigator. In a great number of instances, especially at the commencement of the epidemic, the attacks were so slight that no more attention was paid to them than to an ordinary cold. It is to be regretted that practitioners should have attempted to give a *universal* application to inferences drawn from the favourable results of medicinal treatment in these slight cases. To advertise the fact that potassium bicarbonate had been given in 500 cases "*without a death*," or that salicin had been given in 1,000 cases "*without a death*," was to advance statements that were wholly misleading.

As the disease became better understood and the virulence of its attack, on certain organisations, fully realised, more cautious conclusions as to remedial treatment and more serious concern as to prognosis were manifested by all physicians of experience and knowledge. The grave complications which often occurred, especially in connection with the organs of respiration, in feeble and aged people, was found to be attended with an alarmingly great mortality; and the serious circulatory and nervous disturbances, and the general and alarming asthenia which followed in its train, in many instances, led to a much graver estimation of the seriousness of the malady.

And so in simple, uncomplicated cases of influenza, it came to be recognised that our treatment should be directed *especially* to the avoidance of those serious *after-effects* which were found to appear precisely in those very patients who had been treated with some of the most highly-vaunted *remedies!*

There are many remedies that will relieve the common early symptoms of influenza—the pain in the head and eyeballs, the pains in the back and limbs, the gastro-intestinal pains and occasional diarrhœa, the rise of temperature, the general depression and *malaise;* and there is no reason why they should not be relieved. But the very ease with which this may be effected is apt to mislead both the practitioner and the patient into the belief that what is so easy and pleasant must always be best. This is particularly the case with regard to such drugs as the salicylates, antipyrin, antifebrin, exalgin, etc. A dose of salicin or sodium salicylate, with acetate of ammonia, in a diaphoretic draught, will often relieve the early symptoms of influenza and bring down the temperature rapidly; and antipyrin also will relieve the headache and the gastralgia when they exist. Our predecessors, in former epidemics, accomplished the same with Dover's powder, together with nitrous ether and acetate of ammonia; but not so completely nor so quickly. And it is not against the early and occasional, but against the continued and routine use of such drugs as sodium salicylate and antipyrin that we would protest. A few doses for two or three days may be permitted, but we must then turn our thoughts to the after-effects of influenza, to the influence of the influenza toxin on the heart and the cerebro-spinal nerve-centres. We must try also to lessen the morbid activities of the characteristic microbe which is found in the mucus of the air passages. We believe we should have seen much less of the cardiac asthenia which followed, in so many cases, if more caution had been shown in the use of these mere pain-killing and temperature-depressing drugs. They are very effective, and make a great impression on the patient and his friends, but they divert the practitioner from his most important duty —that is, to guard against "dangers *ahead*," and to give his patients suitable *tonics* from the first. There are those who speak of salicin as a tonic; but *most useful* as we believe this drug to be in the initial stage of the disease, we have had abundant reason to regard it, when taken for long periods continuously and freely, as a cardiac depressant. One of the most frequent symptoms observed during convalescence from influenza is profuse, exhausting perspirations. Salicin, instead of checking, tends to promote this.

The remedy that is most deserving of confidence in the treatment of influenza, after two or three days of salicin treatment, is **quinine.** It seems to be really an *anti-toxin* in this disease. Professor J. Tessier, of Lyons, compares its action, in this disease, to that of sodium salicylate in acute rheumatism; he regards it as the most valuable medicine we possess for the treatment of influenza. Dr. Gaillard, of the Hôpital St. Antoine at Paris, has expressed the same belief.* We are quite aware of the difficulties that arise in giving it to some patients. If the practitioner gives it unskilfully and incautiously or *too soon*, he will often be tempted to discard it as unsuitable. Had it not been so hastily and unwisely set aside by many practitioners, we should have seen far less of cardiac asthenia and other troublesome sequelæ. The best and most efficacious way of giving it is in combination with citrate of potash and ammonia in effervescence, and at first it should be given in small or moderate (*not large*) doses, frequently repeated. From 1 to 3 grains dissolved in 10 to 20 grains of citric acid should be added to a mixture containing a sufficiency of ammonium carbonate and potassium bicarbonate to rather more than neutralise the citric acid. This dose should be repeated every three or four hours, and if there should be profuse exhausting sweatings in the afternoon or evening, a single additional dose of 5 grains of quinine dissolved in lemon-juice should be taken at five in the afternoon. Given in this form, combined with an effervescing saline and preceded by a day or two of salicin treatment, it will be rarely found to disagree even with most sensitive patients; and even if it should give rise to some headache or slight deafness, it is far better to bear with these trivial inconveniences than incur the risk of serious toxic after-effects. Many cases of influenza require little or *no* medicinal treatment; but for those that do, we are satisfied there is no remedy so really beneficial and so calculated to save the patient from serious after-effects as quinine. We select the charts of two cases (Figs. 3, 4), on account of their severity, to show the course the cases took when treated with quinine.

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* "La Grippe," Paris, 1898.

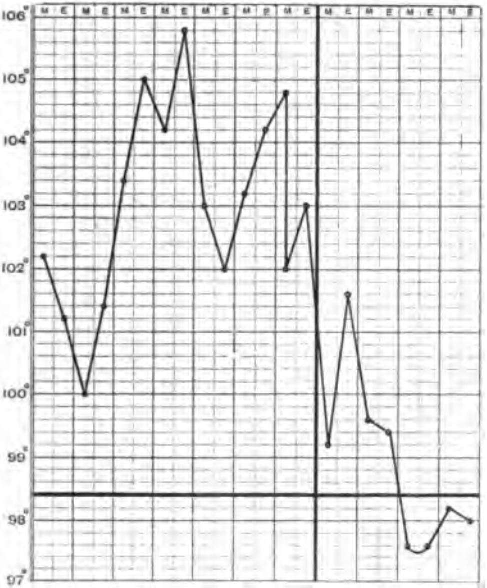

Fig. 3.—Chart of case of Influenza treated with Quinine.

Fig. 3 is the chart of a girl, sixteen years of age, who was admitted into King's College Hospital with a very severe form of influenza in January, 1892. She had extensive pleuro-pneumonia of both lungs, with severe pleuritic pain on the left side. She had a brown, dry tongue. She became actively delirious, and her temperature rose to close on 106°. Her highest pulse rate was 132, respiration 52. Her urine contained albumen. Her treatment was commenced with salicin in a mixture with sodium bicarbonate and ammonium acetate. Each dose, however, was rejected by vomiting. As her temperature was very high, as she was actively delirious, as her tongue was getting brown and dry, and as both lungs were attacked with pneumonia, we were anxious as to the issue of the case. We then ordered her 1 grain of hydrobromate of quinine and 1 grain of phenacetin, every hour, for eight doses, and instructed the house physician to summon us at the end of that time, if he were not satisfied with the effect of the remedy.

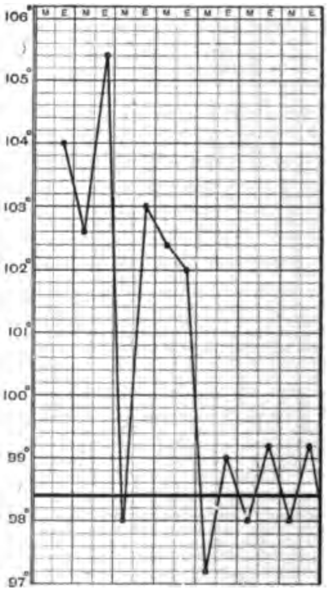

Fig. 4.—Chart of case of Influenza treated with Quinine.

It answered admirably ; the temperature fell, the delirium was quieted, and the tongue improved in appearance. She took the quinine and phenacetin hourly for three days, and she made a rapid and complete recovery. She had some ear trouble during convalescence, which was immediately relieved by causing the mixed vapours of iodine and chloroform to pass into the ear from a cupping glass made hot, and into which a few drops of chloroform and tincture of iodine were dropped.

The other case (Fig. 4) was one of a decided gastro-intestinal type—so much so that the house physician, having regard to the high temperature, the diarrhœa, and the abdominal pain, and the fact that cases of influenza were not at the time common, admitted it as a case of typhoid fever.

This patient was a night watchman, aged 27, and was admitted in February, 1893. He had been "out of sorts" for ten or eleven days, had felt chilly and drowsy, and had had pains in the head. For the last four days he had complained of loss of appetite, diarrhœa, and sickness, and had shivered at night. There was a good deal of general tenderness over the abdomen on admission, with slight diarrhœa, and the motions were of a light colour. Highest pulse rate, 120; respiration, 42. His temperature the day after admission reached 105·4°. He was given the same mixture we are in the habit of prescribing for typhoid fever (*see* pages 674-5)—that is, a mixture containing free chlorine, potassium chlorate, hydrochloric acid, and quinine (2-grain doses) every three hours. The effect was most remarkable. In a few hours the temperature had descended below normal, and in four days he was convalescent, although he was kept in the hospital a fortnight longer by way of precaution.

We have selected these two cases for the purpose of showing how advantageously quinine acts in the severest forms of febrile influenza. In the first case phenacetin in small (1-grain) doses was associated with the quinine, and must be given part of the credit for the quick and good recovery. But we have seen abundant reason for believing that patients treated adequately and early with quinine escape the troublesome after-effects of this disease to a greater extent than can be claimed for any other remedy. Common as cardiac feebleness is as an after-effect of influenza, we administered to an elderly patient, who had long suffered from a weak, dilated heart, through a sharp attack of this disease, the quinine treatment we have described, without his suffering the slightest aggravation of his cardiac debility. With regard to the *preventive* influence of quinine, we have been furnished with abundance of facts, from a variety of observers, in support of the belief that in some constitutions, at any rate, it does exert a prophylactic power, but *not in others*, and this is precisely what might be expected when we remember the extreme variations in sensitiveness to the influenzal poison displayed by different individuals.

We place these remarks on the action of quinine foremost in what we have to say of the treatment of influenza, because we are convinced that practitioners have unwisely allowed themselves to be diverted from the study of this old and tried remedy for infectious fevers to the use of newer drugs of far less real value, although remarkable for their rapid pain-relieving and temperature-reducing properties.

We have said there are many cases of influenza that require little **medicinal** treatment—cases with a moderate amount of pain in the head, back, and limbs, often some patches of cutaneous hyperæsthesia, chilliness, and a moderate rise of temperature, some coryza and laryngeal catarrh, and general depression. Rest in bed, warmth, light, fluid, but nourishing food, some stimulant, of which good port wine and champagne are the best; home-made lemonade for the feverish thirst, and oranges in abundance, are all many such patients need. A gentle aperient, such as effervescing citrate of magnesia, or sulphate of soda, if the bowels are confined; if there is restlessness, from pain and aching of the limbs, 10 grains of

Dover's powder and 15 or 20 grains of salicin, with ½ an ounce of acetate of ammonia and an ounce of camphor water, in a draught at bed-time for a night or two, is comforting and soothing, and is useful to most persons. We believe that this is all that is needed in slight cases, together with moderate doses of quinine continued for a week or ten days after the feverish attack has passed away; but it is rarely safe to overlook the value of quinine during convalescence, even in the slight cases, especially as a protection from remote after-effects.

But there are certain symptoms that require special consideration. An early and sustained high temperature, especially if associated with a tendency to delirium, points either to the absorption of a large amount of the special toxin, or to a peculiar sensitiveness of the organism to the infective agent, or to both. The **indication** is to eliminate the toxin or to neutralise its effect by an anti-toxin, or to lessen the constitutional sensibility to its influence.

It is remarkable how few experimental observations have been made in this direction. Pfeiffer's *bacillus influenzæ* is generally recognised as the infective agent in this disease, and it is especially present in the catarrhal mucus of the air-passages. It would seem probable also that the specific organism, like that of cholera and diphtheria, gives rise to an "intoxication," not to a "septicæmia"; that its toxin is produced on the surface it attacks, and is subsequently absorbed into the blood.

This being the case, efforts to neutralise and antagonise the activities of the infective agent, in the mouth and air-passages, by means of **antiseptic** vapours, sprays, and lotions, are rational and proper. We have seen cases in which a *secondary* infection, after the cessation of the general attack, has appeared to originate in the mouth, affect the salivary glands, extend to the middle ear, and finally involve the brain, which might probably have been prevented by the early, and continued, and adequate use of disinfecting inhalations and antiseptic mouth-washes.

These applications, if they are to be adequate, give, we are aware, a great deal of trouble, and in very many cases they may not be needed; but they probably save a life here and there, and they may be very influential in preventing the spread of the disease.

We have already given our reasons for thinking that quinine acts as an anti-toxin in this disease, especially in certain constitutions; and although we really know very little about phenacetin, it would seem, from clinical observation alone, to be a very valuable addition, in small doses, to quinine, in cases with high temperature and delirium.

If the headache or the gastro-intestinal pain is great, one or two (not more) small doses (5 grains) of antipyrin may be given for its relief.

Salicin and the salicylates will relieve the muscular pains and cause diaphoresis; they are useful mainly for this purpose, and they should be set aside immediately the pains are relieved. There is no sound foundation, that we can discover, for the assertion that salicin is a specific remedy for influenza.

One of the most troublesome and lingering symptoms, in the slighter attacks, is a hard, distressing laryngo-tracheal cough, with scanty, tenacious expectoration. Ordinary sedative, opiate cough syrups and lozenges often aggravate it, by still further thickening the mucous secretion, but a mixture of apomorphine and morphine has been much used for this cough, and often with success. It may be prescribed as follows:—

℞	Apomorphinæ hydrochloridi	gr. j.
	Morphinæ hydrochloridi	gr. ¾.
	Acidi hydrochlorici diluti	ʒss.
	Syrupi	ʒiv.
	Aquæ ... ... ad	℥iv.

M. f. mist. One or two teaspoonfuls for a dose.

Heroin is also a useful remedy for this cough. A good combination is $\frac{1}{24}$th of a grain of heroin with $2\frac{1}{2}$ grains of terpine hydrate in a pill at night.

Relief for this cough will often be found in inhalations of warm saline sprays and antiseptic vapours. A suitable inhalation may be made of 1 dram of glycerine of carbolic acid, 1 dram of spirits of camphor, 2 drams of tincture of benzoin, and $\frac{1}{2}$ an ounce of spirit of chloroform—30 to 60 minims to be inhaled from a jug half full of hot water twice or thrice daily. A dram of menthol dissolved in an ounce of spirits of chloroform also makes a good inhalation for this purpose. The ammonium chloride lozenges also are useful, and, best of all, when the season is suitable, change for a few days to the seaside.

The **bronchitis** and **broncho-pneumonia** which complicate many cases of influenza, especially in the aged and feeble, are, as we have already pointed out, most troublesome to treat, and are often fatal.

The general principles which govern the treatment of these affections, and which we have fully considered in former chapters, apply here also; but in influenza we especially require a remedy which shall *thin* the *tenacious bronchial secretion*, so that the patient shall be enabled to expectorate it and clear his air-passages. With this object, warm, stimulating alkaline drinks should be given freely. Hot milk, with an equal quantity of Apollinaris or seltzer water in cupfuls frequently, with two or three teaspoonfuls of whisky or brandy in each, will often answer well as an expectorant. Ammonium chloride with ammonium carbonate—10 grains of the former and 5 grains of the latter—with 5 to 10 grains of sodium bicarbonate, half a dram of tincture of senega, and 1 ounce of chloroform water, and sometimes a few drops of ipecacuanha wine, will be found also an excellent expectorant, and the addition of a tablespoonful or two of hot water to each dose will often promote its action. Inhalations of hot alkaline sprays, to which a little glycerine of carbolic acid is added, will be found to answer well in children, and may be tried also in adults and old people. Mustard poultices are very useful to relieve the patchy pulmonary congestion that often accompanies influenzal bronchitis, and the free use of *turpentine* liniments is especially useful, partly, no doubt, on account of the antiseptic vapour which enters the air-passages. Active stimulation will be needed in most of these cases.

In the fairly vigorous such measures as these will be attended with good results; but in the old and feeble all our efforts will often prove in vain, and their air-passages will become obstructed by mucus they cannot expel.

Gastro-intestinal catarrh may require, after an initial mercurial aperient, a few doses of bismuth and sodium bicarbonate. Vomiting will be checked by small doses of morphine and hydrocyanic acid.

Cases of a **cerebro-spinal** type, with very severe cephalic pain, delirium, and ocular and auditory disturbances, may require bromides and opiates. Aural catarrh and otalgia are best relieved by the vapour of chloroform diffused into the ear from a hot glass or cup, into which 10 to 20 drops of chloroform are poured from time to time. The addition of a few drops of tincture of iodine to the chloroform, and painting behind the ear with iodine, are also useful.

Cases of *neuritis* following influenza, and associated with loss of power in the extremities, especially in the legs, have been found by Raymond to get well under electrical treatment combined with strychnine internally.*

The nervous and muscular exhaustion that follows most of the severe, and also many apparently slight attacks, requires prolonged rest, and change to the *sea-side* or to *mountain air*, and suitable tonics. Strychnine, coca, arsenate of iron, and valerianate of quinine are among the best. A few weeks of absolute rest in bed, or (in summer weather) on a couch in the open air or in a well-ventilated room, is in some cases almost indispensable. Most practitioners have found that a very free allowance of wine, chiefly sound port and champagne, is needed during convalescence from this disease. The **cardiac asthenia** which often appears both during, and after, influenzal attacks, requires careful treatment. We have called attention to some remarkable cases of post-influenzal cardiac asthenia elsewhere.* Such cases require very prolonged rest, as well as the judicious use of the tonics we have just named. We think strychnine the best, and we often combine iron and quinine with it. Arsenic may be given to patients who cannot take quinine well, and the arsenate of strychnine is a convenient form. In some instances we have had to give full doses of digitalis with large doses of iron and quinine. Phosphorus, phosphide of zinc, and the hypophosphites and glycero-phosphates have been found useful. In the serious syncopal forms hypodermic injections of caffeine, of strychnine, and of ether have been needed.

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* *Journ. de Méd.* November 10th, 1900.

Huchard strongly recommends solutions of camphor in sterilised olive oil in these cases; 10 parts of camphor are dissolved in 100 parts of oil, and 20 minims injected subcutaneously twice or thrice daily.

The *inhalation of antiseptic vapours* has been observed by many to be protective against infection, as well as remedial in the attacks. Eucalyptus oil, for this purpose, has had many advocates; a saturated solution of camphor in terebene has been spoken well of; a liniment composed of equal parts of oil of eucalyptus and chloroform liniment, rubbed warm over the chest, has been found of much service.

Huchard † advises that during an epidemic everyone should gargle or spray their throat, nose, and mouth with weak solutions of perchloride of mercury, formol (1 in 2,000), or carbolic acid (5 in 1,000).

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* Clinical Society's *Transactions*, vol. xxv., p. 185.

† *Bull. de l'Acad. de Méd.*, No. 9, 1900.

Much attention should be paid to the skin, the liver, the bowels, and the kidneys, so that the toxins of influenza may be excreted as rapidly as possible; and in order that few new toxins should be introduced in the food he would make the diet mainly vegetarian, with 2 pints of milk daily, which acts as a diuretic and lessens urinary and intestinal toxicity. The only drug of any value, he says, is quinine. We share, in the main, his estimate of its value.

Perhaps the most popular remedies for this disease have been potassium bicarbonate, antipyrin, phenacetin, quinine, salicin, sodium salicylate, ammonium salicylate, salicylate of quinine, acetate of ammonia, and the ordinary diaphoretics. Formulæ for these and other suggested remedies will be found at the end of the chapter. Isolation from other members of the family is to be recommended, with the view of checking the spread of the disease, which, according to the judgment of the late Sir George Buchanan, "is, in its epidemic form, an eminently infectious complaint, communicable in the ordinary personal relations of individuals one with another."

Old people should be especially and carefully protected from infection, as serious complications are very apt to occur in the aged. The nasal and bronchial secretions should be disinfected; this may be done by expectorating into a portable vessel containing a little 5 per cent. carbolic solution, and by dipping the pocket-handkerchiefs that have been used into the same solution or into boiling water.

Avoidance of exposure to chill and to inclement weather, during the prevalence of epidemics, is, we think, most important, for although the evidence is very strong in favour of the conclusion that influenza is mainly spread by contagion from person to person; there exists also much presumptive evidence in favour of the conclusion that the poison is diffusible into the atmosphere, and that exposure to external cold favours an attack, especially in the aged and feeble.

MALARIAL FEVERS.

We term "malarial" fevers those febrile states which arise in persons who are or have been exposed to "malarial" infection. This "*bad air*" or *malaria* was supposed to be an emanation from the soil in certain regions, which were on that account termed *malarious.* The *infection* was thought to be telluric and contained in the soil, and it was held that under certain conditions it became diffused into the stratum of air immediately overlying it, and so, in certain circumstances, human beings who were exposed to this air became infected. It was believed that the infection could be carried by winds and currents of air to some distance from its place of origin, so that at times it spread far beyond its usual limits, and assumed almost the character of an epidemic. It was also, at one time, thought that *malaria* only occurred in wet, marshy districts, and that surface moisture and decaying vegetable matter were essential to its production. It is now known that such is not the case.

In intertropical regions it is exceedingly common, and in some places continuously present, and in those countries heat and moisture, and a luxurious vegetation, usually co-exist with the presence of malaria. Associated with the belief that the poison was in the soil, it used to be taught that "nothing was so deadly as breaking up the virgin soil in the tropics," and that excavations, or any disturbance of the soil of places that are or had been malarious, was almost certain to be attended with an outbreak of malarial disease, often of a grave form.

It is unnecessary here to enlarge on the geographical distribution of malaria, or to describe the regions that are known to be malarious—they abound in some of the British possessions in India, in Africa, in the Southern States of America, and in many parts of Europe, notoriously in the Roman Campagna and the Pontine marshes, in Italy. In England malaria, if it exists at all in the present day, is limited to a few districts—the fen country and some of the Kent and Essex marshes. But it is probable that the malarial parasite has become extinct in this country.

Until the recent remarkable discovery of the part played by the **mosquito** in conveying this disease from the infected to the uninfected, the exciting cause of the disease was regarded, as we have said, as a telluric infection, and the infective agent was thought to be contained in the soil of malarious regions. The organism, first found in the blood of malarial cases by Laveran, and named by Marchiafava and Celli *plasmodium malariæ*, is admitted to be the real agent in the causation of malarious affections. This organism, until the last few years, was only known in the human blood. How it gained access to the human body and how it left it was a mystery! It was suggested that it entered through the respiratory organs most commonly, and occasionally in water used for drinking, but owing to the admirable experimental researches of Ronald Ross, Manson, and others it is now known to be conveyed from man to man by the bite of the mosquito. The malarial parasite belongs to the group of *Hæmatozoa*, and occupies and destroys the red blood-corpuscles. This organism appears to assume different phases of growth in the different varieties of malarial fever. There is an *amœboid* form which displays active movements within the red corpuscles, and undergoes a process of *segmentation* corresponding to the ague paroxysms. The *larger* forms are found associated with the typical intermittents. The remittent and pernicious forms are associated with a "small plasmodium."

"The general symptoms and morbid anatomy of malaria are in harmony with the changes which this parasite induces. The destruction of the red blood-corpuscles by it can be traced in all stages. The presence of the pigment in the blood and the viscera, so characteristic of malaria, results from the transformation of the hæmoglobin by the plasmodia. The anæmia is a direct consequence of the widespread destruction of the corpuscles by the parasites" (*Osler*). Moreover, the parasites disappear, together with the symptoms, on the administration of quinine.

As suitable prophylactic measures depend on a due apprehension of the part played by mosquitoes in conveying the disease, we must briefly refer to the main facts which have been established in this direction.

We are indebted to R. Ross for the discovery that the parasites of malaria "pass a hitherto undiscovered stage of their existence in mosquitoes, and are then inoculated into our skin by the bites of the insect."* "When a mosquito bites a malaria patient it sucks up a number of malaria parasites with the patient's blood. The parasites burrow into the insect's tissues, grow rapidly, and after a week or two produce a number of spores." These spores enter the poison gland of the insect, whence they are injected under the skin through its proboscis when it bites. The malaria spores thus injected mix with the blood of the person bitten and infect him.

It has been recently discovered that *yellow fever* is communicated in the same way, but by another species! It has been found that only in mosquitoes of the kind termed *anopheles* does the development of the parasites of human malaria occur. So far anopheles have always been found where *fresh* cases of malaria are occurring, and the malaria germs have been found in a large percentage of anopheles caught in infected houses; and occasionally in those caught in the bush, which are assumed to have become infected by having previously bitten villagers dwelling near.

Persons in London have been infected by mosquitoes brought from Italy—while others have been kept immune from fever in mosquito-proof houses in the most deadly part of the Campagna. Malarial fever has been diminished in many localities by draining the breeding places of the anopheles.

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* **Ronald Ross, "Malarial Fever: Its Causes, Prevention, and Treatment" (ninth edition), 1902.**

It therefore seems now within the bounds of possibility that this widespread disease may be prevented and cured with something like certainty.

With regard to the objections that have been made to these conclusions, Ross points out that although it is true that malaria is connected with *stagnant* water, no one has ever found the germ of malarial fever in water or the soil; moreover, it is contrary to all we know of the habits of animal parasites that the malarial germs should diffuse themselves in the air. Another frequently observed fact is also opposed to the old ideas, and that is that of two houses, only a few yards apart, or of even two sides of a barracks or hospital, one may be malarious and the other not so. Again, *wire gauze screens* to the windows, through which the air can enter freely, have proved sufficient to keep out the infecting agent. The true connection between *stagnant* water and malaria is that anopheles breed chiefly in *stagnant puddles* of water on the ground.

The old name, ague, would seem, as Ross suggests, to be a better one than malaria (bad air), as it has been shown that this disease is not due to the latter.

The fact that *relapses*, at long intervals, occur without re-infection by mosquito-bites is explained by the consideration that it is only the *first* infection that is caused by mosquitoes; relapses are due to the latent lingering of germs in the body.

It has also been objected that, in some persons, even the first attack was not preceded by mosquito-bites. This was probably due to the circumstance that these persons were not sensitive to mosquito bites, and *never noticed them* when they occurred.

To the objection that malaria occurs in places which *seem* to be free from mosquitoes, Ross replies that the *anopheles* are not *en évidence*, as some of the other kinds of mosquitoes are, and that they often visit a house *only after dark*, and make but little humming noise. It must also be borne in mind that as the incubation stage lasts at least three days, the onset of this fever, in the case of travellers, may occur at a place some distance from the source of infection.

Relapses often seem traceable to fatigue, exposure to cold, or to bad food.

In connection with prophylaxis it is important to know that the larvæ of mosquitoes and gnats (they are identical) live *only in water*—"tubs, pots, puddles, ponds, and small streams!"—complete *drying* kills them. But the larvæ cannot breathe under water like a fish. They rest hanging head downwards on the surface of the water, the air being drawn in through an orifice near the tail.

The larvæ may be killed by brushing them out of the puddles containing them with a broom—the ground absorbs the water and the larvæ perish. When in water which for various reasons cannot be so treated, *pouring a little thin oil* on the surface of the water, so as to form a fine film over the surface, kills them by *preventing their breathing.* "For drinking water eucalyptus oil is good, because after killing the larvæ it evaporates and leaves no taste in the water."

Another plan is to get rid of all collections, small or large, of stagnant water, in the neighbourhood of habitations, so that there may be no place to harbour larvæ.*

The best disinfectant against mosquitoes in an apartment is *sulphur dioxide.* It has been proved to be far more effectual than formaldehyde. Very dilute atmospheres of sulphur dioxide gas quickly kill these insects. It has remarkable powers of penetrating through clothing and fabrics, killing mosquitoes even when hidden under several layers of towelling in an hour.

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* For further information on this interesting subject refer to Ronald Ross's "Malarial Fever: Its Causes, Prevention, and Treatment."

There are four principal clinical forms of malarial affections:—(1) The *typical intermittent* fever or *ague;* (2) the *remittent* or *atypical* form; (3) the *pernicious* form; and (4) the *malarial cachexia.* A very brief account of these different forms must suffice for our present purpose.

(1) The typical intermittent form is the form we most frequently meet with in Great Britain. Its characteristic features are well known. First, a *cold stage*, generally ushered in by headache, lassitude, nausea, and vomiting. Although in the axilla or rectum the thermometer shows a rise of temperature which may reach 105° to 106°, the surface of the body is cold, and the patient looks pale and cold and shivers, and his teeth chatter. This stage lasts from a quarter of an hour to an hour or longer, and is gradually succeeded by (secondly) the *hot stage*, when the surface becomes very hot and red, the face flushed, and the pulse, which had been small, hard, and quick, becomes full and bounding, and the head throbs and aches. The temperature remains high, and there is intense thirst. This stage lasts three or four hours, and is followed by (thirdly) the *sweating stage.* A copious perspiration breaks out over the whole body, and this is attended with great relief; the headache disappears, the temperature falls rapidly, the paroxysm passes off, and the patient usually falls into a refreshing sleep. The whole paroxysm usually lasts from twelve to fifteen hours, but it may vary considerably, and the cold stage is sometimes absent. The spleen is usually found to be enlarged during the paroxysms. During the interval between the paroxysms the patient feels well. The great characteristic of this disease is the regularity with which the paroxysms return—their periodicity. If the paroxysm returns at the end of twenty-four hours, the type is *quotidian;* if at the end of forty-eight hours, it is *tertian;* if at the end of seventy-two hours, it is *quartan*—this last is a rare form. Golgi has observed in the tertian type that the blood-corpuscles contain small amœboid

bodies which develop gradually, become deeply pigmented, and (just prior to and during the chill) undergo *segmentation* into fifteen to twenty separate bodies, aggregated around the central mass of pigment.

If left untreated, this disease may disappear after a time spontaneously; but it is then liable to recur, and persistence of the fever leads to anæmia and hæmatogenous jaundice from destruction of the red corpuscles by the parasites.

(2) The *remittent* malarial fever is especially seen in tropical countries; it is sometimes termed *bilious remittent* fever and, in India, *jungle* fever. In this form there are no complete intermissions, but only *remissions*, or intervals in which the fever is more or less subdued. The cold stage is less marked, and the third or sweating stage may be absent. The remissions may last twelve hours or longer. The temperature remains constantly above normal, but falls two or three degrees during the remissions, and paroxysms with or without chills may occur, in which the temperature may rise to 105° or 106°. Some cases have a great resemblance to typhoid, and the best diagnostic distinction is to be derived from an examination of the blood for the *plasmodium malariæ.* Vomiting, with epigastric uneasiness, is a marked symptom. Jaundice is not uncommon, and severe headache is usually constant, and occasionally delirium occurs. This form varies greatly in its course and severity.

(3) The *pernicious* form. This is usually a rapidly fatal form. A *comatose* form has been described in which either acute delirium or coma develops rapidly, with high fever and hot and dry skin; also an *asthenic* or *algid* form is described in which there is intense prostration, with sub-normal temperature, vomiting, suppression of urine, and frequently death from profound asthenia; and a *hæmorrhagic* form is also known and is often spoken of as malarial hæmoglobinuria, in which the blood destruction is rapid and the urine

contains both hæmoglobin and blood-corpuscles. These cases are apt to prove rapidly fatal. The pernicious forms are often seen in the tropics; and some Italian physicians describe them as of frequent occurrence during severe malarial outbreaks in Italy.

(4) Finally, there is what is known as *malarial cachexia.* This is generally the result of repeated attacks of ague, although it is said to occur also in persons who have lived long in a malarious region without having actually suffered from fever. It is characterised by great *anæmia*, an *enlarged spleen*, and an irregular sub-febrile state, the temperature varying between 99° and 103° F. The symptoms are those due to the profound anæmia and to the sub-febrile state.

We have taken this brief but general survey of the ground covered by malarial infection, in order that we may enter more profitably upon the consideration of the **treatment** of these morbid states.

Quinine is undoubtedly *the* remedy for malaria—it destroys the parasite in the blood—but it has been stated that the parasites vary greatly, according to their various stages of development, in their resistance to quinine, and that the phase in which they are most sensitive is the amœboid one, which occurs *between the paroxysms*, and that quinine should be given in this period; but Ross maintains that this view is not sound, that the drug should be given as early as possible, "whether the patient has high fever or not."

Manson thinks it best in "simple intermittents" to give the quinine at the commencement of the sweating stage, but in the "bilious" remittent and other grave forms to give it at once and not wait for the remissions.*

Quinine does not render the blood immune from further infection; it only acts as a direct poison to the infective agent when present. Of the various salts of quinine that have been proposed for use in this disease, the *sulphate* justly maintains its wide popularity. The acid *hydrochloride* has the advantage of greater solubility and higher alkaloidal strength (hydrochloride = 81·71 per cent., sulphate 74·31 per cent.), but it is somewhat dearer. The *hydrobromide* has been found valuable for long-continued use, and less irritating to the stomach than the sulphate; it is also well adapted to hypodermic injection.

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* "Tropical Diseases," p. 138.

We have already said that very large doses are not needed in ordinary cases; the main point is to ensure the *absorption* of the drug. Much, we think, therefore depends upon its mode of administration, and we have seen reason for believing that much smaller doses are needed when it is given dissolved in citric acid and combined with a saline effervescent (*see* vol. i., p. 609). It should also, of course, be given, if practicable, when the stomach is empty. Ten to 15 grains will usually check an ordinary paroxysm of ague. It should be given in 3- to 5-grain doses every two or three hours, until the whole quantity has been taken. Given in these divided doses it is less likely to cause vomiting. Even in the most severe cases it is not necessary to give more than 40 grains in the 24 hours. Larger doses are not only unnecessary, they are injurious. Effervescing drinks should be given at the same time, and those made with lemon juice and potassium or sodium bicarbonate are to be preferred. The giving of quinine in pills should be avoided, as they often escape solution and absorption, and if "tabloids" are used they should be broken up and dissolved in acidulated water.* If there is very great objection to its bitter taste, it may be administered in a cachet mixed with an equal quantity of citric acid, and washed down with a wineglassful of lemonade or warm water. *Euchinin* has the advantage of being tasteless, and is therefore useful for children and those who object to the taste of quinine. Some acid drink should be given immediately after the dose to dissolve it in the stomach.

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* Messrs. Burroughs and Wellcome have made for the author tabloids in which the quinine can be taken in an effervescing form, or tabloids of citric acid can be obtained and used for dissolving the quinine.

The following is a convenient formula for the administration of quinine:—

℞ Quininæ hydrochloridi acidi	gr. lxxx.
Syrupi limonis	℥jss.
Aquæ chloroformi	ad ℥iv.

Misce, fiat mistura. One to four teaspoonfuls for a dose, in two to four tablespoonfuls of water.

A teaspoonful of this mixture contains 2½ grains of quinine, so that the dose is easily calculated.

Quinine is sometimes given *by the rectum* when there is difficulty in getting it taken by the mouth, or when, on account of obstinate vomiting, it cannot be retained in the stomach. The rectum must be first washed out with tepid water, then 10 to 20 grains of acid hydrochloride of quinine should be dissolved in a little warm water, and mixed with 2 or 3 ounces of thin starch, and a few drops of laudanum, and injected with a long tube as high as possible. If care is not taken tenesmus will be provoked and a part of the quinine enema will be rejected.

Hypodermic injection offers a very serviceable method of quickly introducing quinine into the system, and is especially applicable to the *pernicious* forms when the patient may be unconscious and unable to swallow. A certain amount of pain attends the introduction of a solution of quinine in this way, but no other risks are incurred, if strict aseptic conditions be observed.

The following formula has been recommended for this purpose:—

℞ Quininæ hydrochloridi acidi	gr. xx.
Aquæ destillatæ	♏xv.

Misce. This fills an ordinary hypodermic syringe, and is a full dose of 20 grains, but much less than this dose is effectual in many cases, given subcutaneously.

Solutions of the *lactate* and of the *hydrobromide* have also been used for hypodermic injection.

We should probably avoid much of the pain that the above concentrated solution causes by using a syringe that would hold half-an-ounce, and diluting this solution to that extent with warm sterile normal saline solution, and then injecting very slowly and deeply in two or three situations.

The buttock, the lumbar region, or between the scapulæ, or the hypochondriac regions, are all suitable places. The solution used should be sterilised by boiling, we should see that the needles and syringe are completely aseptic, and the surface of the skin must be cleansed in the usual way. Captain C. A. Johnston, M.B., of the Indian Medical Service, has reported some very favourable experiences of the hypodermic method.* His plan is to inject 4 grains of the neutral sulphate on five consecutive days, and none of the cases so treated required sick leave or change of climate. By this method he finds that only one-fifth of the amount of quinine (when given by the mouth) is required, and the recovery is quicker and more permanent.

Dr. Fergusson, of Cheltenham, also speaks very highly of the efficacy of hypodermic injections of the *acid hydrobromide* in doses of 3 grains dissolved in 20 minims of pure warm water. This solution is sterilised—the syringe and the patient's skin are disinfected with strong carbolic lotion, and so are the hands of the operator. The needle is sterilised in the flame of a spirit lamp. His experience has convinced him of the superiority of this method of administering quinine in malaria, and that "no cases will resist six subcutaneous doses of 3 grains each of quinine hydrobromide." He gives the injection on alternate days. Many colonial authorities agree with Dr. Fergusson's views, and the hypodermic method of administering quinine in malaria has been very widely adopted and with most satisfactory results. Larger doses than those used by Dr. Fergusson are needed in the more severe and pernicious cases.*

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* *Brit. Med. Journal*, Feb. 22nd, March 29th, and May 3rd, 1902.

Intravenous injection of quinine has been advocated by Baccelli in pernicious forms when other channels of absorption cannot be relied on. Acid solutions cannot be used for this purpose, so he employs the following:—

℞ Quininæ hydrochloridi	gr. xv.
Sodii chloridi...	gr. xij.
Aquæ destillatæ	ʒijss.

This solution is boiled and filtered before using, and when warm is quite clear.

A bandage is applied above the elbow, so as to distend the veins of the fore-arm. A small vein, usually in the middle of the inner side of the fore-arm, is selected, and the needle of the hypodermic syringe is introduced from below upward. The syringe is made to hold 75 minims (7½ grains of quinine), and it and the needle are of course rendered perfectly aseptic before use. The bandage is removed from the upper arm and the fluid then slowly injected into the vein. The occurrence of a small tumour at the seat of puncture would indicate that the needle had missed the vein. The punctured wound is covered with collodion. The symptoms of quinine intoxication soon appear, but do not last more than fifteen or twenty minutes. Baccelli, with 15-grain doses, had brilliant results even in several cases of pernicious type.

Ross thinks that *relapses* occur from the patient leaving off the quinine treatment too soon, and he recommends that the patient should take not less than 20 grains of quinine a day for the first fortnight, 15 grains daily for the second fortnight, 10 grains daily for the second month, 5 grains daily for the third month, and 10 grains once a week for the fourth month; no doubt, if the patient is obliged to continue to live in a malarious district, he had better continue to take small doses of quinine daily. Neurotic persons prone to be made delirious by this drug should be given small doses at short intervals, and these should be stopped as soon as signs of intoxication appear. The hypodermic method, with its far smaller doses, would probably suit these cases best. A full dose of potassium bromide, 40 to 50 grains, may be given should such nervous disturbances become manifest.

The only other cinchona alkaloid that can be, with certainty, substituted for quinine is cinchonidine. Anders has given the sulphate of cinchonidine in doses of 30 to 40 grains daily in protracted cases with very satisfactory results.* In the same class of cases *Warburg's* tincture (½ an ounce three times a day) has been found of service.

Of the value of *arsenic* as a substitute for quinine some difference of opinion exists. Tomassi-Crudeli thinks it of great service as a prophylactic to persons who have to live in malarial districts; others have not found it so.

It is a most valuable tonic combined with iron in the anæmia which follows the fever.

Professor A. Gautier has advocated the use of a new preparation of arsenic—*methylarsenate disodique*—as a specific for malarial fever. It is given hypodermically in doses of 5 to 10 centigrammes. It is reported to have been found efficacious in Algiers in certain cases that had resisted treatment by quinine.

Methylene blue has been given by many Continental observers in cases of malarial fever, and it seems to have a decided curative influence over this disease and checks the development of the *plasmodium*; but the general opinion at present is that it is inferior to quinine in efficacy. The dose given has varied from 1½ to 7 grains thrice daily. Care must be taken to obtain the drug *pure.*

Phenocoll has been used in ague by V. Cervello and other Italian physicians, instead of quinine, or when this drug has failed, and favourable reports of its effects have been published. For adults the dose is 20 to 30 grains daily.

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* Hare's "System of Practical Therapeutics" (second edition), vol. ii., p. 92.

But the treatment of malarial fever is not limited to the administration of quinine. In an ordinary attack of ague, at the first onset of the symptoms, such as pain in the back and limbs, yawning, nausea, vomiting, etc., the patient should go to bed and avoid taking anything into his stomach, either food or drink, as it will only provoke vomiting. During the chill he should be warmly covered, and hot-water bottles applied to the feet and back. Attempts to stop the chill by amyl nitrite, or to abort the attacks by pilocarpine, seem to be of doubtful utility. Some give a full dose of morphine to abort the chill if the case is seen early. No doubt this is an expedient which greatly lessens the patient's sufferings. Tepid water may be given to render the vomiting easier and to wash out the stomach, if this symptom is troublesome; if it persists, some effervescing alkaline drink should be given and a mustard plaster applied to the epigastrium; and if very severe, a small dose of morphine may be given hypodermically. Symptoms of collapse in the cold stage, which may appear in old or feeble and cachectic persons, must be encountered with ether and ammonia mixture and hot coffee with a little brandy.

In the hot stage lighter coverings may be substituted, and the thirst relieved by fragments of ice, and the surface may be sponged over with tepid water to which a little eau-de-cologne has been added. Cold applications to the head will relieve the throbbing headache. Small doses of morphine ($\frac{1}{12}$ to $\frac{1}{24}$ grain), with acetate of ammonia, every four hours have been found to relieve the unpleasant symptoms of the hot stage. Antipyrin has been given to relieve the headache, but its depressing action has often proved injurious. Large mustard plasters are of great use to relieve epigastric pain and congestion of the liver and spleen. During the sweating stage the patient may be allowed to drink freely of water or effervescing drinks, as lemonade or cold tea, etc., and the surface of the body may be rubbed with warm cloths. At this stage, if not before, the specific quinine treatment should be begun in the manner we have indicated. As soon as the temperature has fallen to normal the patient may be permitted to get up and dress and go about.

It is not always necessary, but it is often advisable, to give a purgative when the quinine treatment is begun. In tropical countries this is almost always the rule, and when there exists constipation, with a coated tongue and muddy skin, it is always advantageous. Calomel is usually the best purgative in these cases, and 2 or 3 grains combined with 5 or 6 grains of colocynth and henbane pill, and followed by a seidlitz powder or a dose of Carlsbad salts, will act, as a rule, very efficiently. Some combine calomel with quinine when it seems desirable to speedily get the action of both. Purgatives must not, however, be given as a mere matter of routine, as they may be injurious to the debilitated and to those suffering from chronic intestinal catarrh.*

The appropriate **after-treatment** of these cases consists in giving blood restoratives and tonics, and a generous diet, with a moderate amount of stimulants, such as sound wine or beer. Cold or tepid baths, with frictions and exercise in the best air that is attainable, should be also advised. Small or moderate tonic doses of quinine, with mineral acids, should be given daily; and in very anæmic cases a pill of arsenate of iron (⅛ to ¼ grain) should also be taken three times a day after meals. The bowels should at the same time be kept open by gentle aperients. We should be on our guard against relapses, and on any rise of temperature we should return at once to the quinine treatment.

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* Tomassi-Crudeli ("Climate of Rome and Roman Malaria," p. 158) calls attention to a popular remedy which he and other Italian physicians think well of. It is a decoction of the whole lemon fruit. A lemon is cut into thin slices with the whole of the rind and seeds, and is boiled in three glassfuls of water until reduced to one glassful; this is strained, and the remains of the boiled lemon pressed forcibly. It is given to the patient in the morning.

In the **remittent** form the treatment should be conducted on precisely the same principles as in the typical intermittent form. As vomiting and gastric irritability are almost always present in these forms, it may be best to give the quinine hypodermically. It is especially in these cases that comparatively small doses of quinine (2 to 3 grains) dissolved in citric acid and given every two or three hours in combination with an effervescing saline, as we have repeatedly advocated in this work, answer so well, and will often be retained even when the stomach has manifested great irritability to other medicines. Constipation, if it exists, must be overcome. Repeated small doses of calomel and ipecacuanha have been recommended for this purpose. To avoid delay and ensure an action of the bowels, enemata of soap and water containing a spoonful or two of castor oil should be given when necessary.

To relieve the headache, delirium, and other nervous symptoms the administration of morphine with atropine has been advised; but there is this great drawback to the use of morphine, that it tends to further embarrass the action of the liver, and it favours constipation. We should prefer to give full doses of bromide by the rectum, with chloral if needful. If we find large doses of quinine are absolutely required we must give them hypodermically—10 to 15 grains every hour or two—and their effect must be maintained by continuing to give 20 to 40 grains daily. The disease, as a rule, will soon yield to this method of treatment. The patient's strength must be maintained by suitable food and stimulants, and we shall often for this purpose be obliged to have recourse to rectal feeding.

In the **pernicious** form quinine must at once be given in full doses, as already described, either hypodermically or by intravenous injection. We must make efforts to keep up the patient's strength by rectal injections of beef-tea and brandy, peptonised milk, tea, coffee, etc. Frequent hypodermic injections of strychnine may be needed ($\frac{1}{30}$ to $\frac{1}{20}$ grain every hour or two). Morphine with atropine must be given to allay restlessness. Ether, camphorated oil, and caffeine may also be used, as cardiac stimulants, hypodermically. If there has been *hæmatinuria* during the attack, on recovery, in addition to quinine, perchloride of iron with arsenic will be needed for the relief of the extreme anæmia which is likely to follow. The addition of strychnine has been strongly advocated by American physicians.

Malarial hæmoglobinuria or *Blackwater fever* often resists the action of quinine, and R. Koch and others, who have carefully studied cases of this type, maintain that quinine causes the hæmoglobinuria by exercising a destructive action on the blood corpuscles, which are already damaged by the preceding diseased condition of the blood—the malaria! If, then, while giving quinine this symptom appears, the drug should be stopped; the patient should be put to bed, and a dose of calomel, followed by a saline purgative, given. For the vomiting, a mustard plaster to the epigastrium is valuable; and no food should be given by the mouth, but the patient should be fed by nutrient enemata.

Very successful results are reported to have followed the use of a mixture containing in each dose ½ a dram of liquor hydrargyri perchloridi and 10 grains of sodium bicarbonate; this is given every three hours for four days. It is found to control the vomiting and to increase the flow of urine, and it is suggested that "the alkali neutralises the acidity of the stomach and urine and stimulates the renal epithelium, the mercury probably acting as a gastro-intestinal disinfectant."* The pyrexia, if severe, was treated by cold sponging and a few 5-grain doses of phenacetin.

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* Observations on fifteen cases of Hæmoglobinuric Fever in British Central Africa, by Dr. Hearsey, *Brit. Med. Journal*, Jan. 26th, 1901. The perchloride would be decomposed in Dr. Hearsey's mixture!

Malarial cachexia, characterised by profound anæmia and an enlarged spleen, and attended by symptoms of gastro-intestinal catarrh and hepatic congestion, needs to be treated on general principles. Iron, arsenic, strychnine, nitro-hydrochloric acid, bismuth, ammonium chloride, nitrate of silver, ipecacuanha, podophyllin, calomel, bichloride of mercury, and many other drugs, have been advocated for this condition, and all or any of them may prove suitable to individual cases. But change of climate, dietetic cures, and mineral-water cures are, perhaps, more successful than any other treatment for these patients. Hydrotherapy and massage have been found very useful in the treatment of the local congestions common to this state. Bracing seaside resorts and sub-alpine mountain resorts, among attractive scenery and with scope for pleasant excursions, where blood regeneration can be favoured by a life spent much in the open air, are best suited to those cases.

For the gastro-intestinal and hepatic troubles the following spas are suitable, the selection depending on the nature of the individual case and constitution :—Vichy, Homburg, Kissingen, Carlsbad, Marienbad, Bridès, Tarasp, Pyrmont, and others.

Prophylactic measures have already been alluded to ; they consist in (a) attacking mosquitoes in their breeding grounds, (b) the careful use of mosquito nets,* and (c) the regular use of quinine, about 3 to 5 grains, daily. Those who cannot tolerate quinine should not be sent to malarious districts.

TETANUS.

The discovery of the **tetanus bacillus** by Nicolaier has thrown a flood of light on this hitherto mysterious and fatal malady. The fact that the symptoms of this disease were prone to make their appearance after the reception of wounds or injuries, or even *slight abrasions of the skin*, occurring in a variety of circumstances, was suggestive of the belief that it was caused by the entrance into the body of some infective agent from without. Tetanus is now demonstrated to be an infective disease due to the action of a micro-organism which develops at the site of the wound, and there produces *toxins* which poison the spinal cord and cause intense exaggeration of its reflex excitability. It does not invade the blood and the organs. Instances have been reported to occur from exposure to cold, or from sleeping on damp ground. In such cases it may be concluded that the specific microbe gains an entrance to the body through some slight unnoticed abrasion of the surface, or of the mucous membranes continuous therewith. Its observed endemic occurrence, at times, was highly suggestive of an infectious origin.

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* **For details, refer to Ross's "Malarial Fever: Its Causes, Prevention, and Treatment."**

The specific bacillus has been isolated and cultivated. It is a slender rod with a rounded end ("drum-stick-shaped"), and may grow into long threads. The products of its culture injected into animals excite symptoms of tetanus. Brieger has separated from these cultures poisonous substances capable of producing the disease. One of these ptomaines, which produces symptoms of tetanus, has been named tetanin ; it is a tox-albumen of remarkable virulence. The symptoms it causes develop slowly, and this fact has given rise to the suggestion that it acts only after it has undergone some further changes in the organism. The natural home of this bacillus is the soil and the intestinal canal of herbivorous animals. The disease has been excited by inoculating animals with garden earth.

Another important fact, bearing on the therapeutics of the disease, is that animals can be made to acquire a high degree of anti-toxic immunity, and they then yield a *protective serum*. It has, however, been found difficult to cure animals with this serum, as the toxin is apt to *combine* with the nerve cells during the period which elapses before the appearance of the symptoms.

The specific microbe has been found in surface soil and in putrefying fluids, and this will account for the fact that the antiseptic treatment of wounds, on the battlefield, has been found to protect largely from subsequent attacks of tetanus. A form attacking new-born children and parturient women —the poison gaining entrance in these instances, doubtless, through the umbilicus in the one case, and the generative passages in the other—has often been very prevalent in hot countries, especially amongst the negroes of the West Indian Islands. In these cases there can be little doubt that the strict application of antiseptic principles, in dealing with parturient women and new-born children, will prove preventive of the disease. Indeed, it is said that this form of the disease has disappeared since midwives have been taught to dress the navel with iodoform.

We have not space to enter into a detailed description of the symptoms of this disease. They usually appear within two weeks of the injury. The most characteristic are tonic spasms of the muscles, usually beginning in those of the face and neck. Sustained spasmodic contraction of the muscles of the jaws leads to trismus or *locked jaw.* The drawing down of the angles of the mouth causes a characteristic grin known as *risus sardonicus.* The spasms extend to the other muscles of the body, especially those of the back; the patient is thrown into a state of opisthotonos, the back is arched, and the body rests on the head and heels. Various other forms of spasmodic contraction occur. The spasms are more or less paroxysmal, the slightest irritation is sufficient to bring on the paroxysms, and the more violent ones are attended with agonising pain. The temperature may remain normal, but it is often raised, and in some instances very high temperatures have been recorded, 105° to 106° F., and even 109° to 110° F. just before death. Cases in which the symptoms are late in coming on often recover; those in which they follow quickly after infection are generally fatal, death occurring in a few days.

With regard to **treatment**, there can be no doubt that the thorough application of aseptic methods in the dressing of wounds, however trivial, and in the performance of operations, is an important preventive measure. Da Costa justly remarks: "Perfect asepsis in surgical procedures means freedom from tetanus as surely as it means freedom from septicæmia." If tetanus actually exists and a wound is found, free excision and antiseptic treatment of the wound must be carried out.

Owing to the extreme excitability of the nervous system, the patient must be isolated in a darkened room and kept absolutely quiet. Concentrated fluid food and stimulants must be freely given. When, owing to spasm, there is difficulty in giving food, a stomach-tube, attached to a funnel, must be passed along the floor of the nose, through the pharynx into the stomach, and the patient fed in that way. It may be necessary to give chloroform twice or thrice daily to permit of this being done. Brandy or whisky, from 4 to 16 ounces daily, should be given; it acts as a sedative to the nervous system and promotes muscular relaxation. The bowels may be relieved by enemata once daily, and the possibility of the occurrence of retention of urine must be borne in mind. Of drugs, the most efficient is a combination of chloral and potassium bromide in large doses. Chloral has been given hypodermically, and by intravenous injection, with success in some very severe cases. These drugs may also be given by the nose tube or per rectum. A dram of potassium or sodium bromide, with 20 grains of chloral, may be given every two or three hours. Chloral may act curatively by its antiseptic as well as by its sedative properties. Inhalations of chloroform prove of great service in allaying the paroxysms, and when these are attended with great suffering it may be necessary to keep the patient almost continuously under its influence. The injection of atropine into the tetanised muscles has proved a useful adjunct to the chloral and bromide treatment. Inhalations of *nitrite of amyl* and hypodermic injections of nitro-glycerine have also been found of service. *Opium* and *morphine* are of undoubted value in this disease. They should be given freely, and are usually well borne. A plan of injecting morphine deeply into the affected muscles has been of great service, and under this treatment the masseters have relaxed and food has been taken.

Many other drugs have been used in the treatment of tetanus, and curative virtues have been claimed for them, such as aconite, conium, cocaine, curare, cannabis indica, physostigma, gelsemium, tobacco, duboisine, hyoscyamin, etc.

Carbolic acid has been injected subcutaneously by Baccelli and others in cases of tetanus, and with good results. Mr. Place, of Bombay,* has adopted this method of treating tetanus in horses, and with gratifying results. He uses large doses. He injects a dram of the B.P. carbolic acid in the neighbourhood of the neck and shoulder every two hours for the first thirty-two hours of treatment, and then less frequently. The largest amount used in any case has been 39 fluid drams in eighty-four hours. He mentions that Colonel Williams, R.A.M.C., has successfully adopted this treatment in human subjects in relatively large doses. Successful results have been published by others, and generally very large doses have been given—in one case as much as 99 grains of carbolic acid in the first twenty-four hours.† It is usually injected in 2 per cent. solutions. This method merits a more extensive trial.

Many cases of tetanus have now been treated with tetanus **anti-toxin,** and both successful and unsuccessful results have been published. Osler considers its use in the treatment of human tetanus "has been disappointing. The best results are obtained in the sub-acute cases, but here the prognosis is relatively favourable, even with other methods of treatment. There may be occasion for the *prophylactic* use of the anti-toxin in man, as already successfully practised in arresting the spread of the disease in horses occupying infected stables."*

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* *Lancet*, Feb. 24th, 1900, p. 538.
† *St. Louis Medical Review*, Dec., 1899.

In an editorial estimate in the *Lancet* † it is said: "When the results are examined by any unbiassed critic it must be acknowledged that the anti-toxin treatment has not fulfilled the expectations to which its first successes gave rise. When injected subcutaneously it seems to benefit those cases only which are not very acute or very severe, and even when injected under the *dura mater* or intra-cerebrally it does not appear to be much more efficacious," and abscess of the brain has followed this mode of administering the remedy.

On the other hand, Von Leyden,‡ in the course of his observations, found that the spinal cord and the cerebro-spinal fluid contained tetanus toxin, and that subcutaneous or intra-venous injections, though capable of rendering the toxin in the blood harmless, was powerless to attack the toxin in the cerebro-spinal fluid; therefore he adopted the suggestion of Jacob, his assistant, and tried *intra-dural* injections. In a very severe case it was applied with success: the temperature was 105·8° F. when, on the third day, 5 c.c. of anti-toxin (only ⅛th of the usual subcutaneous dose) was injected *intra-durally*—after the withdrawal of 10 c.c. of fluid. Morphine hypodermically and chloral internally were given at the same time. The temperature rapidly fell to 101·3°. After three days the injection was repeated and the patient recovered.

The serums most commonly employed are Tizzoni's and Behring's. The usual dose is 20 to 30 c.c. for the first dose, and 15 to 20 c.c. every five or ten hours after. As tetanus anti-toxin does not exercise any noxious influence on the organism, there is no reason why *large* doses should not be used—they should correspond to the severity of the case.

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* "Practice of Medicine" (fourth edition).

† *Lancet*, March 10th, 1900, p. 705.

‡ *Deut. Med. Woch.*, July 18th, 1901.

The following summary of indications * presents a rational guide to the treatment of this disease:—

(1) To destroy the bacilli at the seat of infection, and thus prevent a further production of toxin. Excise or enlarge the wound—remove all foreign matter and apply suitable antiseptics.

(2) Endeavour to eliminate from the body the toxins already absorbed. Give freely of water to drink—withdraw a certain amount of blood by venesection, and substitute for it normal saline solution.

(3) Apply anti-toxin treatment, as it seems to have a beneficial influence and has reduced the mortality—according to certain statistics—from ninety to forty per cent.

(4) Immunise the body, after *suspected* local infection has taken place, by prophylactic injection of anti-toxin, as has been successfully carried out in veterinary practice and in lying-in hospitals.

(5) Other measures must not be neglected, as isolation and quiet, stimulants, and the free use of narcotics.

The Jenner Institute of Preventive Medicine has published the following instructions as to the use of tetanus anti-toxin (fluid):—

(1) The dose of the fluid anti-toxin for tetanus is 10-20 c.c. every six or twelve hours, according to the urgency of the symptoms and the duration of the incubation period; as a rule, the shorter the latter the more severe the disease.

The dose is proportional to the gravity of the disease and not to the size of the patient.

(2) The syringe must be boiled for five minutes immediately before the inoculation. The syringe recommended by the Institute contains 10 c.c., and may be obtained either at the above address, or from Messrs. Allen and Hanbury, Plough Court, E.C. After this dose has been introduced, and if it be

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* Moschrowitz, *Annals of Surgery*, Oct., 1900.

thought necessary to inject more, the needle is left *in situ* and the barrel of the syringe refilled. The syringe after using is to be rinsed in water and then boiled for one minute.

(3) The injection is usually made under the skin of the abdomen, and a swelling appears, which is, however, absorbed in a few hours. A little tenderness sometimes persists for twenty-four hours. The skin must be washed with carbolic acid (1 in 20) before the inoculation is made.

(4) In certain cases (especially when wounds are soiled with earth and in certain districts), it might be advisable to employ tetanus anti-toxin as a preventive measure. For this purpose 10 c.c. should be injected every fortnight for six weeks.

(5) An erythematous rash sometimes appears two or three days after the injection. This need cause no apprehensions.

The serum should be kept unopened in a dark and cool place—in an ice-safe, if possible—and will remain active for several months.

ADDITIONAL FORMULÆ.

For influenza—febrile form.

℞ Quininæ sulphatis
Extracti cinchonæ } āā ʒss.
Extracti aconiti radicis, gr. jss.

M. et divide in pil. xx. One three times a day. (*Huchard.*)

For influenza with pulmonary catarrh and inflammation.

℞ Pulveris ipecacuanhæ compositæ, ʒss.
Pulveris scillæ, ʒss.
Quininæ sulphatis, ʒss.

M. et divide in pulv. xx. Four to five daily. (*Huchard.*)

For gastric pain and vomiting in influenza.

℞ Sodii bicarbonatis
Magnesiæ calcinatæ
Bismuthi salicylatis } āā gr. v.

M. f. pulv. Three to five daily. (*Huchard.*)

As a pulmonary antiseptic and for relief of headache and muscular pains.

℞ Benzol. pur., ♏lxxx.
Spiritus vini rectificati, ℥j.
Tincturæ chloroformi comp., ʒiij.
Mucilag. tragac. ad ℥viij.

M. f. mist. A tablespoonful every two or three hours in lemonade. (*Robertson.*)

Carbolic acid in influenza.

℞ Acidi carbolici puri, ♏ij.
Syrupi simplicis, ♏xl.
Tincturæ cardamomi compositæ, ♏x.
Spiritus chloroformi, ♏x.
Aquæ menthæ piperitæ ad ℥j.

M. f. haust. To be given every four hours until the temperature is normal. Give also for sleeplessness at night.

Pulv. ipecac. comp., gr. x.

Syrup for the cough.

℞ Liquoris morphinæ hydrochloridi, ʒj.
Acidi hydrobromici diluti, ʒj.
Chloroformi puri, ♏iij.
Tincturæ limonis, ʒj.
Syrupi ad ℥jss.

M. f. syrup. A teaspoonful for the cough. (*Simson.*)

Mixture in influenzal pneumonia.

℞ Ammonii carbonatis, ʒiv.
Tincturæ cinchonæ, ℥ij.
Spiritus ammoniæ aromatici, ʒiv.
Decocti cinchonæ ad ℥xij.

M. f. mist. Two tablespoonfuls with a tablespoonful of lemon-juice in effervescence every four hours. (*Whitla.*)

Camphor in influenza.

℞ Spiritus camphoræ } āā
Tincturæ lavandulæ } ʒij.
Spiritus chloroformi, ʒj.
Mucilaginis tragacanthæ, ℥ij.
Aquæ ad ℥vj.

M. f. mist. Two tablespoonfuls every four hours.
(*Devereux Long.*)

For the pulmonary complications of influenza.

℞ Ammonii chloridi, ʒij.
Apomorphinæ hydrochloridi, gr. j.
Misturæ glycyrrhizæ compositæ, ℥jss.
Syrupi, ℥jss.

M. f. mist. A dessertspoonful every two hours.
(*H. C. Wood.*)

For the diarrhœa of influenza.

℞ Bismuthi subnitratis, gr. x.
Acidi carbolici, gr. jss.

In a capsule. One every two, three, or four hours.
(*H. C. Wood.*)

Capsules for influenza.

℞ Salol, gr. lx.
Phenacetin, gr. xl.
Quininæ sulphatis, gr. xx.

M. et divide in cap. xx. Two to be taken every three hours. (*E. B. Palmer.*)

For severe neuralgic pains in influenza.

℞ Exalgine, gr. lxxv.
Tincturæ aurantii ♏lxxv.
(rub together and add sufficient alcohol to dissolve the exalgine).
Syrupi aurantii, ℥j.
Aquæ destillatæ ad ℥v.

M. f. mist. A tablespoonful for a dose (one or two doses will usually suffice). (*Bardet.*)

To relieve headache, pain, and sleeplessness in influenza.

℞ Chloral, gr. xxij.
Syrupi codeiæ,* ℥j.
Infusi tilliæ,* ℥iij.

M. f. mist. A third to be taken at first, followed by a tablespoonful every hour.
(*Larmande.*)

In pneumonia and post-influenzal asthenia.

℞ Tincturæ kolæ } āā ℥j.
Tincturæ cocæ }

M. f. mist. Two to four teaspoonfuls daily in water.
(*Huchard.*)

Diaphoretic in influenza.

℞ Pilocarpinæ hydrochl., gr. ss.
Morphinæ sulphatis, gr. ss.
Aquæ, ℥iij.

M. f. mist. A teaspoonful every fifteen minutes.
(*H. C. Wood.*)

As a substitute for quinine in influenza.

℞ Strychninæ sulphatis, gr. $\frac{1}{48}$.
Cinchonidinæ salicylatis, gr. ij.

M. f. pil. To be taken every four hours. (*Packard.*)

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* French Codex.

CHAPTER VI.

THE TREATMENT OF CHOLERA.—THE TREATMENT OF CEREBRO-SPINAL FEVER.

CHOLERA—A Specific Microbic Infection—Mode of Diffusion—Course and Symptoms—(1) *Stage of Invasion*, Gradual or Sudden—Purging—Vomiting—Cramps—(2) *Stage of Collapse*, or "Algid" State—Symptoms of this Stage—(3) *Stage of Reaction*—Cholera Typhoid—Cholerine—The "Comma" Vibrio—Its Mode of Action—Anti-choleraic Vaccination—Prophylactic Measures—Indications for Remedial Treatment—Purgatives — Castor Oil — Calomel — Chloroform and Camphor, Turpentine—Caution in the Use of Opium—Intestinal Antiseptics — Salol — Chloroform — Tribromophenol—Bismuth — β-Naphthol—Thymol—Hot Intestinal Injections of Solution of Tannin—Quinine—Intravenous or Subcutaneous Injection of Warm Saline Solutions — Subcutaneous Injections of Camphor and Oil—Hot Baths, etc. etc.—Summary.

CEREBRO-SPINAL FEVER — Causation — A Micro-organism—Anatomical Characters—Great Variability in its Different Forms—Their Symptoms—Complications and Sequelæ—Diagnostic Methods—Lumbar Puncture—*Treatment*—Morphine Hypodermically — Wet-Cupping — Ice-bags — Baths — Perchloride of Mercury—Potassium Iodide—Other Remedies.

CHOLERA.

IN order that we may establish **rational indications** for the **treatment** of cholera, we must first inquire briefly into its pathological nature and its characteristic symptoms and manifestations.

It has now been clearly established that cholera is a disease resulting from a *specific microbic infection;* the pathogenic organism, the presence of which stands in causal relationship to this disease, being the *comma bacillus* or *vibrio* of Koch.

The infection is conveyed from infected to non-infected districts by human agency, and the spread of epidemic cholera always follows the accustomed routes of human intercourse and travel. Contaminated water plays the chief *rôle*, directly or indirectly, in its diffusion and spread. At the same time, it is necessary to remark that the infective organism may be conveyed in a more direct manner from the infected to the non-infected. And it does not follow, because water is the agent chiefly concerned in its spread, that it cannot be conveyed in other ways. The fact to be remembered is, that the cholera infection depends on the passage of a specific micro-organism from the interior of one human body into that of another, and that water is the agent usually concerned in the transference. We shall return to this part of the subject when treating of prophylactic measures.

What are the characteristic course and symptoms of this extremely fatal malady? So far as can be ascertained, the *incubation* period of Asiatic cholera is a brief one. The average is probably about two or three days; in some instances it has appeared to be considerably longer, and in many much shorter—not more than twelve hours. It is usual to recognise three stages in the course of the disease—(1) that of invasion, (2) that of collapse, and (3) that of reaction.

The period of *invasion* may be *gradual* or sudden, and this probably depends on the amount or the virulency of the infective agent received into the body in each case, or on the individual sensitiveness and reaction to the pathogenic organism. It should not be overlooked, because it has an important bearing on the success of treatment, that different individuals, and the different composition and state of the contents of their alimentary canal, act as so many different culture media to the pathogenic microbe; and the factors being different in different cases, the results are different. We desire to emphasise this, because the failure of therapeutic resources is constantly spoken of as though they ought to have an *absolute* rather than a *relative* influence on the cure of disease. Nothing could be more irrational. The idea is a survival of the old belief that the *cure of disease* is something supernatural, instead of being as strictly conditioned as every other event in life.

Upon the nature of the *invasion* stage will depend much of the success or non-success of therapeutic intervention. When it is *gradual,* it may last for two or three days, and is then marked by moderate diarrhœa, with colicky pains, a sense of exhaustion and general depression, noises in the head, and a pale and anxious countenance. It is during this period that we may hope to be able to counteract, in an effectual way, the toxic influence of the infective agent.

In other instances the invasion is *sudden.* The patient is struck down suddenly with alarming depression, and generally with violent purging. The contents of the bowels pour out in a copious liquid stream, and rapidly drain the blood of its fluid constituents. The evacuations, at first bile-stained or fæcal, soon become colourless, and have been spoken of as "*rice-water stools,*" from their resemblance to water in which rice has been boiled. They contain enormous numbers of comma bacilli and other bacteria. At the same time, *profuse vomiting* of the same kind of fluid usually occurs. Violent and very painful *cramps* may now appear, affecting chiefly the lower extremities and the abdomen; and the patient may pass into the second stage—the "*algid*" state, or state of *collapse.* This may come on within a few hours of the commencement of the purging, and its symptoms have been regarded as dependent, either on the amount of toxic material absorbed from the intestine, or on the enormous drain of fluid from the body, so that there is failure of the circulation, as the thickened blood cannot flow freely, and the pulse becomes feeble, thread-like, or wholly imperceptible. The surface is livid, cold, shrunken, and covered with a clammy sweat; the countenance also is shrunken and blue, the eyes are sunk, the nose pinched and pointed, the tongue cold, the breath cold. The axillary temperature is sub-normal—93° to 94°—but the temperature in the rectum and vagina may be found raised, in this stage, from 100° up to 104°. It was noted during the epidemic at Hamburg in 1892 that severe cases have a very low temperature from the first, and that the fatal ones terminated without its rising. The respirations are quickened up to 30 or 40. One of the most distressing symptoms due to loss of fluid from the body is *intense thirst.* There is great muscular feebleness and exhaustion, sometimes accompanied by extreme restlessness, at others by complete mental apathy. There is, however, no loss of consciousness, and the patient may be roused to reply to questions, although the voice is feeble or almost inaudible. The abdomen is retracted, distressing hiccough frequently occurs, and there is often complaint of burning heat in the epigastrium. Another consequence of the drain of water from the blood is *suppression of urine.*

Death may occur rapidly in this collapsed stage—in twelve hours or less—or it may be protracted to the second day; or the patient may pass out of this stage of collapse into the third *stage*, that *of reaction.* After, perhaps, a brief sleep, the circulation improves, the surface becomes warmer, the features are less shrunken, and there is some return of colour; the temperature in the axilla rises a degree or two. Recovery is often extremely and remarkably rapid. In some cases, however, relapses occur during the reactive stage, purging and vomiting return, and death from exhaustion may follow. Sometimes there is only partial reaction, and the pulse remains weak, the surface cold, the bowels relaxed, and there are signs of nervous irritability and exhaustion—drowsiness and depression, or sleeplessness, and even maniacal excitement. The appearance of a roseolous exanthem on the skin is observed in some cases during convalescence. The renal secretion is slowly re-established, and usually contains albumen. It is important to see that it is not retained in the bladder.

There is sometimes observed a form named "*cholera sicca,*" in which there is no purging, and this is usually a rapidly fatal form, and the intestines are found, *post-mortem,* filled with the rice-water evacuations. It is probable that in these cases the toxic action on the nervous system is especially virulent, and the intestinal walls are paralysed.

A typhoid state—*cholera typhoid*—sometimes occurs during the reaction period, marked by delirium, a dry tongue, feeble rapid pulse, and slight rise of temperature. This may terminate rapidly in coma, or after some days it may end in recovery. It has been referred to uræmia.

The form termed *cholerine*, which is often observed during epidemics of cholera, and which assumes various degrees of severity and is attended with diarrhœa, colic, vomiting, cramps, and occasionally slight collapse, is probably in some cases a kind of abortive cholera, and in others merely an intestinal catarrh contributed to by nervous alarm and errors in diet.

The "**comma vibrio**" is always found in the discharges from the bowels and in the contents of the intestine in this disease; it has the form of a slightly curved rod, thicker than the tubercle bacillus, and about one-half its length. Although several micro-organisms have been found resembling it in shape, its true specific characters are distinctively displayed in cultures in various media. It has not been observed to form spores, and it does not appear to be a very resistant organism. It perishes, more or less quickly, in common water. It has been found only in the intestinal canal, and the symptoms it gives rise to are wholly due to the toxins it forms there, as it does not enter the blood or tissues; indeed, it is killed off rapidly if introduced into them.

During cholera epidemics virulent organisms are occasionally found in the intestinal discharges of perfectly healthy persons, showing that they enjoy an *immunity* from infection by these bacilli; moreover, cholera cultures have been swallowed with impunity.

The pathogenic microbe of cholera belongs, like that of diphtheria, to the class of infective microbes which produce an "intoxication" by the absorption of the products of their vital activities from the locality, outside the tissues, in which they have settled—that locality, in this case, being the intestinal canal.

If the system could be rendered insensible to this poison, which is elaborated through the agency of the cholera bacillus in the intestine, immunity from this disease would be secured; and this is the object of Haffkine's and other methods of anti-choleraic vaccination. The system is first acclimatised to a *weak* cholera poison (first vaccine), and afterwards to a *strong* cholera poison (second vaccine). The second must consist of the strongest cholera poisons obtainable, in order that the protection may be adequate. The object is "to enable the system to tolerate such quantities of cholera poisons as might be expected to be absorbed from the intestine during the interval which elapses between the invasion of the alimentary canal by the comma bacillus and the natural elimination of that bacillus, which invariably takes place when convalescence becomes established after an attack of cholera." It does not aim at producing a tolerance of enormous amounts of cholera poison, as that would be impossible, but to induce a sufficient tolerance of the cholera poison to "enable the system to put forth its whole reactive power."

In Haffkine's method, with strict precautions to ensure sterility, the *weak* vaccine is injected under the skin of one flank and, four or five days afterwards, the *stronger* vaccine is injected into the opposite flank. A cubic centimetre is the quantity used on both occasions. Some slight local and general disturbance, with rise of temperature, follows each injection; but no untoward symptoms or results have been observed in the 100,000 or more persons who have been inoculated. The method may, therefore, be deemed a perfectly safe one. In a paper read by Haffkine before the Royal Society, in June, 1899, he stated that some 8,000 persons were inoculated with the protective serum in Calcutta and kept under observation for two years. They for the most part dwelt in the same locality, and often in the same house, with members of their families who had not been so treated. The uninoculated were attacked with a severe form of cholera, while the inoculated appeared to be completely protected until the 420th day, when cholera began to spread among them. So that the inoculation only serves as a temporary prophylactic, for the ratio of deaths to persons attacked was the same amongst the inoculated and the uninoculated. The method is still on its trial, and we may hope that it, or some modification of it, may ultimately be found to be a trustworthy prophylactic for those who are exposed to this very fatal disease.

It may be mentioned as bearing on the subject of protective inoculation that Professor Nencki's experiments led him to the belief that it is not infection with the comma bacillus only that causes the virulent form of cholera, but that contact with other bacteria in some way increases its virulence. Professor Hueppe, as the result of his study of the outbreak of cholera at Hamburg, concludes that there must be three links (or factors) in the chain of infection—the exciting cause of the disease, which he terms x (the "comma" bacillus), the individual predisposition z, and the local and temporary conditions y. Bacteriologists, he considers, under the guidance of Pasteur and Koch, have exaggerated the x. The absence of either of these links, however brought about, must prove protective; so that general prophylactic measures have the greatest possible chance of success.

Cantani's observations of the last epidemic in Naples induced him to regard protective inoculation with mistrust, for he there encountered well-marked second attacks of cholera four to six weeks after the first equally well-marked attack.

Plain and simple as **prophylactic** measures against attacks of this disease are, they are undoubtedly difficult of application to the members of those classes who invariably become its first victims, and who are especially responsible for its spread. The one word "*cleanliness*" comprises nearly all that can be urged by way of prevention; but it is not of much use preaching cleanliness to those classes who have all through their lives been utter strangers to its meaning. "Cleanliness" means additional trouble, additional labour; and filthy habits are bred of indolence rather than of ignorance. It is only panic, and the fear of death, that will rouse these classes, for a time, to the energy that is needed in order to be clean!

The discovery of cholera bacilli in the stools of certain perfectly healthy persons, to which we have already referred, and the fact that convalescents may harbour cholera bacilli in their intestinal tract for many weeks, makes it evident that a perfectly healthy person or a convalescent may possibly be the means of conveying the disease from one place to another.

During a visitation of cholera, actual or threatened, it is needful to pay more than usual attention to the observance of the ordinary laws of health. All causes of physical exhaustion, excesses of all kinds, should be avoided. Moderation in food, in exercise, in physical and mental effort, should be observed. Everything that can lower the general tone should be guarded against. Great moderation in the use of alcoholic stimulants should be specially enjoined. All drinking water and all milk must be boiled and kept in carefully closed vessels. The water used for washing the person and all domestic utensils must also be boiled, unless its source is absolutely beyond the possibility of contamination.

All outhouses and receptacles for refuse should be cleansed and freely whitewashed, and the refuse destroyed. No overcrowding of work-, sleeping-, or other rooms should be permitted, and adequate ventilation should be enforced. No accumulations of dust should be allowed, and all walls, floors, shelves, etc., should be frequently cleansed of such deposits. It is best to use for this purpose wet cloths wrung out in an antiseptic fluid and plunged after use into boiling water containing some antiseptic. Cleanliness of the persons of domestics and others should be seen to, and particularly those who have the care of children, amongst whom often the disease first appears. *Children* require the most careful watching, as they are so apt, those of the poorer classes, to consume unclean food and to be dirty in their personal habits. Fruit and vegetables should be eaten with great caution, and only such as are in a perfectly fresh and sound state. All food bordering on decomposition is most dangerous. The agency of **flies** in spreading cholera has been abundantly demonstrated, and great care should therefore be taken that they do not settle on or contaminate any food supplies, and efforts should be made to exclude them from dwelling-houses. Atmospheric conveyance of infection is comparatively rare, as the germs when dried die rapidly. Isolation of infected persons should be strictly carried out, and everything that is used in or comes from the sick-room should be thoroughly disinfected, as has already been pointed out in the preceding chapters on the treatment of infective fevers.* Attacks of diarrhœa or stomach disturbance should receive immediate medical attention, and great caution should be observed in treating such cases. It should be borne in mind that if the attack happens to be a mild or abortive form of cholera, opium internally is likely to do harm, though there is no objection to small doses given hypodermically to relieve pain, and it is in all cases safer and better to give a mild purgative such as Gregory's powder, with some warm carminative such as the aromatic spirits of ammonia and essence of peppermint. If after such a dose an astringent seems necessary, it is best to give an intestinal antiseptic, such as bismuth subnitrate, or salicylate.

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* The following have been found in Germany to be the best and cheapest disinfectants for use on a large scale:—(1) Chlorinated lime. (2) *Milk of lime*, made by breaking up 1 part of quicklime in 4 parts of water; the lime is first slaked with a portion of the water, and the rest stirred in; this is kept in a closed vessel, and shaken when used. (3) Carbolic acid. (4) Steam sterilisation and the boiling temperature. (5) For washing purposes, soft (potash) soap, 1 lb. to 17 quarts of water, and 5 per cent. of carbolic acid added; articles are completely immersed in it and boiled for half an hour. The *stools* have been disinfected in the wards with *lysol* or carbolic acid, and afterwards thoroughly mixed with chloride of lime. Lysol is a coal-tar product resembling carbolic acid, but is cheaper; it is used in 1 to 3 per cent. solutions.

The great recommendation of these bismuth compounds, when given in *large* doses and kept suspended by mucilage, is that they form a protective antiseptic coating to the epithelial covering of the intestinal walls, and so present an obstacle to the absorption of toxins from the contents of the intestine.

It is known that the cholera germ does not grow in *acid* media, and guinea pigs have been given opium and alkalies experimentally to make them sensitive to the attack of the cholera bacillus when taken by the mouth. We might naturally infer that the proper treatment of human beings when attacked would be the avoidance of opium and the administration of acid drinks, such as sulphuric acid lemonade. It may be as well also to remember that bismuth subnitrate parts slowly with nitric acid in contact with water, which would make it particularly appropriate to the treatment of the diarrhœa of the initial stage.

From a consideration of the nature and pathological characters of this disease the following **indications** for remedial **treatment** may be deduced :—

(1) To destroy or annul the activities of the cholera bacilli in the intestines, and to render the chemical poison they elaborate there inert, and to sweep both out of the body. (2) Subsequently to protect the denuded intestine. (3) To eliminate or neutralise the already absorbed poison. (4) To replace the lost fluid so as to counteract the thickening of the blood due to this loss. (5) To relieve symptoms, chiefly the *vomiting* and the painful cramps. We must remember that the functions of the liver and kidneys are for the time suspended. This is generally believed to be dependent on the loss of the fluid essential to their function.

It will be seen from these indications that the *rational* and scientific treatment of cholera is mainly **eliminative** and **antiseptic.** When cases of cholera are seen in the first stage, when nature is making an effort to throw off the poison by the bowels, we must aid her by the administration of an unirritating purgative, and if we can at the same time combine with it an intestinal antiseptic, we shall be fulfilling very completely the first indication. A small dose of castor oil is one of the best purgatives for this purpose. Calomel is also valuable, and it is an antiseptic as well as a purgative. Gregory's powder, together with a few grains of calomel, may be prescribed if, owing to vomiting, castor oil cannot be taken.

We would suggest the following emulsion of castor oil :—

℞ Olei ricini	ʒvj.
Chloroformi	♏xx.
Essentiæ menthæ piperitæ	♏xl.
Syrupi et mucilaginis	ad ℥ij.

Misce, fiat mistura. A tablespoonful every 15 minutes until the whole is taken.

If either of the doses is vomited it should be immediately repeated. If for any reason castor oil cannot be taken, we should give calomel—a dose of 5 grains at first, and a grain every hour until about 10 grains have been taken; then we should continue to give it in ¼-grain doses every two hours as an antiseptic. We should give at the same time a stimulating and antiseptic mixture of chloroform and camphor; and as gastric absorption is almost abolished, we might expect this mixture to reach and disinfect the small intestines.

The following is a suitable formula :—

℞ Chloroformi	♏lxxx.
Spiritus camphoræ	āā ʒij.
Spiritus ammoniæ aromatici	
Mucilaginis acaciæ	℥ij.
Aquæ menthæ piperitæ	ad ℥viij.

Misce, fiat mistura. Two tablespoonfuls every hour.

The chloroform and camphor both yield antiseptic and anæsthetic vapours, and we might hope these would have an anti-toxic and soothing effect in the small intestine; or capsules of chloroform and camphor might be given.

Liebermeister is a warm advocate of the *calomel* treatment. If treatment is begun *early*, he gives small doses of opium, frequently repeated. Then if the diarrhœa continues he gives 5 to 7 grains of calomel every hour or two "until the appearance of profuse green calomel stools," and then returns to the opium. "Under special circumstances the administration of calomel may require repetition later on."*

Treatment on these lines, in the early stage, has been found to be the most successful in recent epidemics in Germany, Russia, and Italy. One Russian physician began the treatment with 20 grains of calomel and an ounce of castor oil, and he reports that the mild cases recovered quickly, and so did many in the algid state. Another started with a purgative dose of calomel combined with naphthalin, and continued with smaller doses of each. In Hamburg, mild threatening cases were stopped by an initial dose of castor oil, and in more advanced stages calomel in 1½-grain doses or in repeated small doses of $\frac{1}{6}$ to $\frac{1}{8}$ grain was found to answer well. In severe attacks, those of well-marked general intoxication, we are informed, "calomel was the only drug that held its own," although opium in the early stage is still advocated by many Indian authorities.

In the reports of recent European epidemics there is a general condemnation of the use of *opium* to arrest the diarrhœa of the early stage. Cases so treated did worse than under any other treatment. The early use of opium increases the risk of the absorption of the cholera poison and favours its retention in the body. In Hamburg opium by the mouth, in sedative doses, had a decidedly unfavourable effect, but small doses of an aqueous solution, given subcutaneously, sometimes acted remarkably well. We recognise the usefulness of opium to relieve *pain* and to lessen nervous exhaustion, and we see no reason why one or two small doses of morphine should not be given hypodermically, or a mixture of opium and camphor liniments rubbed in freely over the abdomen. It is doubtless by its soothing and conservative action on the nervous system, rendering it less sensitive to the morbid toxins that have been absorbed, that opium is valuable. It, in this way, lessens the tendency to fatal exhaustion; but small doses only should be given.

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* Nothnagel's "Encyclopædia of Practical Medicine" (English translation), art. "Cholera."

An experienced Indian medical officer, now retired, writes to us, "If I were unfortunate enough to catch it (cholera), opium would be the last drug I would take. I have never given it in a single case, but always castor oil."

Other methods have been adopted for neutralising the effects of the bacillus, and its chemical secretions, in the intestine, and with good results. The part to be played by purgatives is obviously a brief one, and, after the toxic contents of the intestine have been swept away, we have to trust to intestinal antisepsis to neutralise any further development of toxins; and we have to fulfil another indication, and that is "to protect the denuded intestine." If we continue the use of calomel, it should be for its antiseptic action, and repeated small doses of ⅙ and ⅛ grain have been found best for this purpose.

Large doses of bismuth subnitrate and salicylate combined, mixed with mucilage and chloroform water, should prove most useful in fulfilling this indication, as :—

℞ Bismuthi subnitratis	āā gr. xxx.
Bismuthi salicylatis	
Mucilaginis acaciæ	ʒii.
Aquæ chloroformi	ad ℥j.

M. f. haust. To be taken every two or three hours.

Salol, as an intestinal antiseptic, has not maintained the reputation that was somewhat prematurely claimed for it. Those who had the best opportunities of testing its value in the Hamburg epidemic concluded that no confidence could be placed in it. We note that one observer, who wrote in its praise, gave 15 minims of chloroform with 10 grains of salol every two hours, and he does not appear to have realised that the chloroform may have been the more efficacious remedy of the two. We have a great belief in the value of chloroform, if it can be made to reach the intestinal canal; and Desprez has warmly advocated the use of the following mixture:—

℞ Chloroformi	♏xv.
Alcoholis	ʒij.
Ammonii acetatis	ʒijss.
Syrupi morphinæ hydrochloratis (Fr. Codex)	ʒx.
Aquæ	ad ℥v.

Misce, fiat mistura. A tablespoonful every half-hour until the symptoms are relieved.

He also recommends chloroform water as a preventive. In a former epidemic in England we observed apparently preventive properties in chloroform and camphor drops, made by dissolving 3 drams of camphor with 1 dram of chloroform; 4 or 5 drops on a small lump of sugar were taken two or three times a day as a prophylactic.

Tribromophenol (or *bromol*), obtained by the action of bromine on phenol, has been highly praised by Prof. Hueppe as a remedy in cholera. It is not poisonous, and has "almost a specific effect" on comma bacilli. He uses a combination with bismuth—tribromophenol bismuth; this neutralises the poison and protects the intestinal mucous membrane. He gives 75 to 105 grains a day in 7½- to 15-grain doses. He has used it in all stages and forms of severity, and he has been very satisfied with the results. Next to this he considers calomel the best remedy.

A combination of *β-naphthol* and *bismuth* has been given by Nencki to promote intestinal antisepsis, and with good results.

Thymol has also been found very fatal to the cholera microbe; and in 1,000 solution in water is said to kill the comma bacillus in five minutes; and it has been proposed to inject into the bowel 4 grammes (60 grains) of thymol dissolved in 4,000 grammes (125 oz.) of water. This brings us to the recommendation of Cantani, which has been largely adopted and widely approved—viz. large **intestinal injections of solutions of tannin:** 3 to 4 pints of a 2 per cent. solution of tannin, with or without a few drops (20 to 40) of laudanum, at a temperature of 100° to 104° F. Cantani believes that with these large injections, given slowly, with the buttocks raised, the resistance of the ileo-cæcal valve is overcome, and that the fluid finds its way into the small intestine. The author of this method asserts that, if applied in the early stage, nearly every case recovers; and most of those who had charge of cholera cases in Hamburg write in its praise. Hueppe says it "cleans the large gut, moderates the diarrhœa, and warms up the chilled body," and others testify to its "curative effects" in moderately severe cases. The injections are given after each stool, usually about every three or four hours; they are said by Cantani to increase the acidity of the intestinal contents, to kill the cholera bacilli, and to lessen their toxic effects. Some Russian physicians also wash the stomach out with Cantani's solution of tannin (5 in 1,000) at 104° F. A quart of the solution is slowly injected into the stomach through a hard indiarubber tube, and two quarts are also injected by the rectum. Vomiting is arrested thereby and diarrhœa checked. Alexinsky, who adopted this method, gave also 20 drops every hour of equal parts of Hoffman's anodyne and ethereal tincture of valerian; also calomel $\frac{1}{10}$ grain, opium $\frac{1}{10}$ grain, and bismuth 5 grains, every hour. Attention has been called to the value of *quinine* in cholera by some Russian physicians, and the anti-toxic effect of this drug has perhaps scarcely been sufficiently examined in this disease. The hydrochloride has been given subcutaneously in 30 per cent. solutions in boiling distilled water, with the addition of a little chloride of sodium; and after cessation of the vomiting it has been given by the stomach in combination with salicylate of bismuth and opium. Brilliant results from its use are claimed. Professor Botkin used to give quinine both as a preventive and a remedial agent.

The *third* indication, "to eliminate or neutralise the already absorbed poisons," is one that, with our present knowledge and resources, it is not easy to fulfil. We may, perhaps, best fulfil it by endeavouring to aid the system to eliminate the poison in its own way, by helping it to tide over the serious part of the crisis—*i.e.* the first intense shock and injury of the absorbed poison—and, in order to do this, we must give effect to the *fourth* indication, which is "to replace the lost fluid, and so to counteract the thickening of the blood due to its loss" and revive the circulation. Now this can be and was done, especially during the epidemic in Hamburg, in a very effectual manner; and by universal testimony many lives were saved thereby, although the method employed frequently fails to save the more desperate cases.

The method used for this purpose is the *intravenous* or *subcutaneous injection* of large quantities of warm saline solution. These injections cannot repair the injury done by the poison to the heart muscle, or to the vaso-motor nerves, but they dilute the poison and carry off the products of metabolism; they stimulate the heart's action, and the constitution gains time to struggle with the poison, and often with success; they also afford an opportunity of strengthening the patient with food and medicine. The solutions are usually composed of 6·6 per cent. of common salt, dissolved in water, sterilised by boiling, and rendered alkaline by the addition of a little sodium bicarbonate.

If injected into a vein, about 3 to 4 pints are used *warm*—rather less if injected subcutaneously.

In either case the transfusion is made by gravitation only.

"The warm solution is placed in a glass jug with a nozzle, to which a wide insoluble tube is attached, and either hung up on a hook in the wall or placed on a special stand, a fall of about 4 to 5 feet being allowed, which has always been found sufficient (Fig. 5). A vein is laid bare by an incision 2 to 3 inches long (usually in the arm—when both arms have been used the saphena is next tried), with antiseptic precautions, and tied. The cannula is introduced and tied in above the ligature, the pinch-cock is opened, and the whole quart is infused in two to four minutes. The effect is sometimes astounding. The cyanotic, algid, pulseless, breathless creature, with shrunken, wrinkled features, sunken, lacklustre eyes, and the whole aspect of a moribund, will, as if from a deep sleep, arouse himself and tell the delighted doctor he feels vastly better."

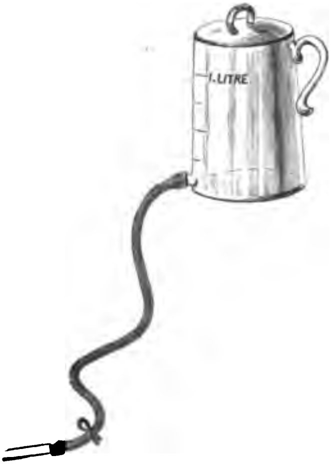

Fig. 5.—Vessel used for Intravenous Injections.

If the injections are made subcutaneously, as Cantani advises, it is desirable, owing to the large quantity that has to be injected, to introduce it at two or three places. The hypochondriac regions are usually selected.

Liebermeister aptly suggests that these injections would be more likely to be attended with *permanent* good effects if they were begun earlier, before the vital organs (heart, kidneys, etc.) had been so gravely injured by the loss of water.

Subcutaneous injections of camphor dissolved in olive oil (20 minims) every half-hour or hour have been often combined with the above method, with great advantage in the algid state. Ether, strychnine, and digitalin have been injected subcutaneously for threatened cardiac failure.

Other measures of minor importance have been found useful in dealing with certain symptoms. To restore warmth and circulation prolonged hot baths (half an hour) at a temperature of about 100° F. have been used, and after the bath a very large hot mustard poultice has been applied over the whole of the abdomen and lower half of the chest. This measure has been found very useful in many cases, but in the *algid* state it will be better to have recourse to the large hot rectal injections and the subcutaneous injection of hot saline solutions. Some, however, consider hot baths more exhausting than beneficial, and prefer hot fomentations, hot sandbags to the feet and legs, and friction with the warm hand. The *painful cramps* are relieved by these hot applications, by firm rubbing with the hands, and also by subcutaneous injections of small quantities of morphia. The *vomiting* may be relieved by sucking ice, by iced champagne, or by a few doses of cocaine with chloroform; or, as we have mentioned, by washing out the stomach.

To relieve the *thirst*, hot tea and coffee, toast and water, and in the collapse stage hot water, should be given freely, avoiding, however, over-distension of the stomach.

A small amount of brandy or whisky may be added to the hot tea or coffee, and champagne diluted with seltzer may be given, but large quantities of strong alcoholic stimulants are not well borne.

During the febrile reactionary stage much caution must be observed in feeding the patient; we should prescribe a spare liquid diet and copious diluent drinks, such as Apollinaris or seltzer water mixed with warm milk; if constipation occurs a mild saline like Carlsbad water is the best aperient; and during the convalescent period a tonic of quinine and hydrochloric acid, and for some time only light, chiefly fluid, food.

The treatment that has been found to answer best in the latest European epidemics may be thus summed up:—In the early stage gentle purgatives to aid the natural efforts at elimination of the infective microbe and the toxic substances it elaborates; opium liniment externally, or small doses of morphine hypodermically, to relieve pain and cramp; intestinal antiseptics, of which calomel is the best, to neutralise the toxic action of the comma bacillus in the intestine, and bismuth to protect the denuded intestinal membrane; avoidance of the use of opium for the purpose of checking diarrhœa, its use being reserved for the relief of pain and for its soothing effect on the nervous system; hot large intestinal injections of tannin; in the algid state, the intravenous or subcutaneous injections of large quantities of hot saline solutions; subcutaneous injection of camphor to stimulate the circulation, and hot baths and other hot applications to maintain the heat of the body; and the various remedies mentioned to relieve special symptoms.

CEREBRO-SPINAL FEVER.

This interesting disease is also known by the names *epidemic cerebro-spinal meningitis*, *spotted fever*, and *malignant purpuric fever*. It is caused by an *infective* micro-organism known as the *diplococcus intracellularis*, and is attended by inflammation of the cerebro-spinal meninges. It is a very fatal disease, and occurs in epidemics and also in single cases. It is a rare disease in this country, but appears to be not uncommon in America. The epidemic outbreaks are usually localised and not widely diffused, and are apt to occur where persons are crowded together, as in barracks, jails, and asylums. Children and young adults are most prone to be attacked, and especially young soldiers and recruits. Physical and mental depression and exhaustion are predisposing causes. It does not appear to be directly contagious. It has been thought that the sporadic form is closely related to, if not identical with, the disease described as *posterior basic meningitis.*

The anatomical changes, as shown in *post-mortem* examinations, are those of a suppurative or fibrino-purulent lepto-meningitis of the brain and spinal cord. Its amount and distribution are variable. Micro-organisms are found in the exudation.

Malignant, ordinary, and anomalous forms have been described. In the *malignant* form the onset is sudden, usually with rigors, headache, somnolence, muscular spasms, great lassitude and a moderate rise of temperature, and a slow, feeble pulse. There is usually a purpuric rash. In this form death is often very rapid—sometimes after only a few hours. In the *ordinary* form the onset is also sudden, with rigors, occipital headache, and vomiting. Painful stiffness of the muscles of the neck is an early symptom. The pulse is full and strong and the temperature is raised to 101° or 102° F. The head may be drawn back from contraction of the neck muscles, there is much pain in the back and limbs; with increase of headache there is dread of light and sensitiveness to noise, irritability and restlessness. Muscular tremors occur with tonic or clonic spasms in the limbs, and rigidity of dorsal and cervical muscles, so that the occiput may be drawn back till between the scapulæ. The facial muscles may be involved in spasm, and strabismus is common. There is often great tenderness along the spine. Delirium occurs early and may become violent, but yields in a few days to stupor, which passes into coma as the effusion increases. Great variability has been noted both in pulse and temperature. There is much variability also in the occurrence of cutaneous symptoms; *herpes* is very common—petechial and other eruptions are sometimes present and sometimes absent. Leucocytosis is marked and constant. The *diplococcus* has been isolated from the blood during life. Albumen is sometimes found in the urine. At the onset vomiting may be severe. The bowels are usually confined.

Extreme variability in its course is characteristic of this curious disease. It is often fatal within the first few days, while other cases will go on for months. Signs of improvement are fall of temperature, diminution of spasm, and return of intelligence. Convalescence is slow, and liable to interruption from complications and sequelæ.

Remarkable *anomalous* forms also occur. There is an *abortive* form in which, after a severe onset, the symptoms subside in a day or two and convalescence is rapid. There are also *mild* cases in which the symptoms are so vague that they could not be recognised except during the course of an epidemic. An *intermittent* type has been described with an intermittent or remittent pyrexia, as in pyæmia. Osler and others have also met with *chronic* forms which have persisted for three to six months.

Numerous *complications* are mentioned by different authors as more or less common in this disease—pneumonia, pleurisy, pericarditis, parotitis, polyarthritis, chronic hydrocephalus, persistent headaches, etc. etc. Sequelæ affecting the eye and ear are not uncommon, as might be expected in a disease of this character. The presence of nasal catarrh has an especial interest in connection with this disease, as it has been suggested that the meningitis may originate in an infective rhinitis—for the nasal secretion often contains diplococci.

Two diagnostic methods, of some interest, may be mentioned.

One is known as *Kernig's sign.* "When the thigh is flexed at right angles to the abdomen, the leg can be extended upon the thigh nearly in a straight line. If meningitis be present, strong contractures of the flexors prevent the full extension of the leg on the thigh." Osler found this sign present in all his recent cases.*

The other method is that of *lumbar puncture*, which is also employed as a therapeutic measure. This operation is performed in the following manner: In children it is best to give an anæsthetic—then the patient is turned on the right side, with knees drawn up and back bent; a small aspirating needle, guided by the thumb and index finger of the left hand, is inserted to one side of the median line in the interspace between the laminæ of the third and fourth lumbar vertebræ, and thrust deeply upward and inward until it reaches the spinal canal. The spinal fluid escapes drop by drop, and if meningitis is present it is generally turbid, and sometimes purulent or bloody. The fluid must be examined in the usual way for micro-organisms. In acute cases the diplococcus may be present in large numbers.

Treatment in these cases is not very promising, the death rate varying in different epidemics from 20 to 75 per cent. The mortality is much greater in the case of children than adults. It is difficult in a disease of this kind to formulate any rational indications for treatment. Morphine given hypodermically has been commended as useful in quieting the restlessness and irritability, in relieving pain and in procuring sleep. It also tends to relieve the distressing vomiting. Recovery has been reported to follow *lumbar puncture* in certain cases. The lessening of the tension, which follows this simple operation for the removal of cerebro-spinal fluid, appears to be attended with good effects, and it is just possible that it may be advantageous to remove some of the infective toxins secreted by the diplococci as well as a proportion of the micro-organism itself. At any rate there seems no good reason why it should not receive further trial. In robust patients the application of wet cups to the nape of the neck has been found to relieve pain. Ice-caps and ice-bags have also proved useful in lessening the headache and spinal tenderness. The *continuous* application of the spinal ice-bag is commended by Osler, and so is Aufrecht's method of employing systematically the tub-bath at 98°. It should be given every third hour. Blisters have not been found beneficial, but the application of Paquelin's cautery lightly to the skin of the back of the neck has been thought useful. Improvement has been said to follow the hypodermic injection of perchloride of mercury, and it is certainly a remedial measure which should not be lightly passed over. Potassium iodide has been strongly advocated by some observers, but we do not know whether inunction with iodoform has yet been tried. Potassium bromide has been given to allay the spasms, but it is not so efficacious for this purpose as a combination of morphine and atropine. Calabar bean, ergot, and large doses of quinine have all been tried, but neither of these drugs has commended itself to general adoption.

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* "Practice of Medicine" (fourth edition), p. 107.

Quite recently it has been recorded that recovery has followed the administration of antipyrin in doses of 5 to 10 grains three times a day.*

To relieve the vomiting an ordinary effervescent saline draught with a few drops of hydrocyanic acid and a few grains of sodium bromide has been found of service.

Constipation is best treated by enemata of warm soap and water, with which a teaspoonful or two of castor oil may be mixed.

During the continuance of pyrexia the diet should be fluid but nutritious—milk, clear soups and broths, and stimulants, such as whisky or brandy, when cardiac weakness becomes evident. With some patients difficulties have occurred in attempting to give them food in the ordinary way, and forced feeding with the stomach-tube has been resorted to.

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* *Brit. Med. Journal*, May 24th, 1902, p. 1262.

Convalescence is often remarkably protracted, and is frequently attended with great emaciation, debility, and severe headache; tonics such as quinine and iodide of iron are needed, and for the headaches phenacetin with caffeine, or bromides, may be prescribed.

THE END.

GENERAL INDEX.

⁂ *An Index of the Principal Authorities quoted or referred to will be found on pages* 810—18.

Abscess of liver. *See* Hepatitis, Acute suppurative, II. 149—55
Acetate of lead in diarrhœa, I. 237
  in hæmoptysis, II. 77
  in mercurial stomatitis, I. 12
Aconite in acute nasal catarrh, I. 507
  in acute pharyngitis, I. 21
  in apoplexy, II. 267, 270, 272
  in infantile paralysis, II. 298
  in neuralgia, II. 330
  in pneumonia, I. 611
  in scarlet fever, II. 631
  in tonsillitis, I. 15
Addison's disease, I. 485, 486
  Indications for treatment, I. 486
  Stimulants in, I. 486
  Symptoms, I. 485
Adonis vernalis in cardiac valvular lesions, I. 355
Ague. *See* Malarial fevers, II. 713—80
Albuminuria, II. 203—7
  Aperients in, II. 206
  Baths in, II. 206
  Conditions under which it occurs, II. 203—5
  Exercise and diet in, II. 205, 206
  in apparently healthy persons, II. 203
  Mineral waters in, II. 206
  Tonics in, II. 205
  Treatment, II. 205
  See also Bright's Disease, II. 223—51
Alcohol in acute bronchial catarrh, I. 526, 537
  in acute endocarditis, I. 335
  in Addison's disease, I. 486
  in aortic insufficiency, I. 373, 377, 378
  in cardiac palpitation, I. 410
  in cholera, II. 746, 757
  in chorea, II. 396
  in chronic bronchial catarrh, I. 560
Alcohol in diphtheria, II. 590
  in dysentery, I. 259, 265
  in gangrenous stomatitis, I. 11
  in gout, II. 509
  in pericarditis, I. 329
  in phthisis, I. 688, II. 79
  in pneumonia, I. 622—28, 639
  in scarlet fever, II. 635
  in typhoid fever, II. 672
  in ulcerative sore throat, I. 23
  in urinary affections, II. 190
Alkalies in acute bronchial catarrh, I. 526, 528
  in acute endocarditis, I. 333—34
  in acute pericarditis, I. 327
  in catarrhal stomatitis, I. 3
  in chronic gastric catarrh, I. 56—57
  in diabetes, II. 530, 536
  in dyspepsia, I. 167
  in enteralgia, I. 189
  in gout, II. 493—97,
  in hepatitis, II. 162, 163
  in lithiasis, II. 186
  in rheumatism, II. 465, 570—72
  in ulcer of the stomach, I. 176—77
Alkaline hypophosphites in phthisis, II. 45—46
Alum in chronic laryngeal catarrh, I. 519
  in epistaxis of measles, II. 644
  in hæmatemesis, I. 130
  in hæmaturia, II. 198
  in ulcèrative stomatitis, I. 9
Alum-whey in pyuria, II. 220
Ammonia chloride in chronic nasal catarrh, I. 511
  in hæmoglobinuria, II. 201
  in hepatitis, II. 167
  in influenza, II. 709
  in neuralgia, II. 334
Amœbæ coli in abscess of liver, II. 150, 152, 153
  in dysentery, I. 253
Amyl nitrite in anginal paroxysm, I. 431
  in asthma, I. 570

- Amyl nitrite in hæmoglobinuria, II. 201
  - in intermittent fever, II.
  - in status epilepticus, II. 405, 406, 422
  - in tetanus, II. 784
- **Anæmia,** I. 453 – 75
  - Characters of blood corpuscles in, I. 453, 454
  - Definition of, I. 453
    - *See also* Additional Formulæ, I. 476, 477
- **Anæmia, Pernicious,** I. 471—77
  - Antiseptics in, I. 475
  - Antistreptococcic serum in, I. 475
  - Arsenic in, I. 473
  - Bismuth in, I. 474
  - Bone-marrow in, I. 473, 474
  - Diet in, I. 475
  - Iron in, I. 474
  - Massage in, I. 473
  - Symptoms, I. 471
  - Transfusion in, I. 475
- **Anæmia, Primary or idiopathic.** *See* Chlorosis, I. 456—71
- **Anæmia, Secondary or symptomatic,** I. 455—71
  - Arsenic in, I. 470
  - Blaud's pills in, I. 465
  - Causation of, I. 455
  - Chloride of gold in, I. 470
  - Compressed-air baths in, I. 470
  - Diet in, I. 458—60
  - Ferratin in, I. 467
  - Hydrotherapy in, I. 461
  - Hygienic measures in, I. 460, 461
  - Iron in, I. 463 – 70
  - Manganese in, I. 469
  - Medicinal agents in, I. 462—71
  - Orexin tannati in, I. 465
  - Oxygen inhalations in, I. 470
  - Symptoms, I. 456
  - Syrup of hæmoglobin in, I. 466
  - Transfusion in, I. 470
    - *See also* Additional Formulæ, I. 476, 477
- Anchylostomum duodenale, I. 284, 303
- **Aneurism, Internal,** I. 440—51
  - Blood-letting in, I. 442, 451
  - Calcium chloride in, I. 445
  - Causation of, I. 441
  - Diet in, I. 442, 443, 450
  - Distal ligature in, I. 446 – 47
  - Electrolysis in, I. 445—46
  - Ergot and ergotin in, I. 448—49
  - Gelatinised serum in, I. 449—50
  - Ice applications in, I. 450
  - Indications for treatment, I. 442
  - Influence of form in, I. 441
  - Introduction of foreign bodies into sac in, I. 446

Aneurism, Internal *(continued)*

  - Medical aspects of, I. 440
  - Potassium iodide in, I. 444, 450
  - Proximal pressure in, I. 447
  - Relief of pain in, I. 451
  - Rest in, I. 442, 443
  - Sodium iodide in, I. 445
  - Symptoms of, I. 441, 451
  - Tracheotomy in, I. 451
    - *See also* Additional Formulæ, I. 451-52
- **Angina.** *See* Pharyngeal catarrh, Acute, I. 19 – 28
- **Angina pectoris** I. 419—34
  - Arsenic in, I. 429
  - Arterial tension in, I. 421—22, 424
  - Avoidance of toxic agents in, I. 427—28
  - Causes of, I. 420, 422—425, 427—428
  - Chloroform in, I. 432—33
  - Classification of cases, I. 420—21
  - Diet in, I. 426, 428—29, 431
  - Digitalis in, I. 430
  - Dyspeptic conditions in, I. 427
  - Electric current in, I. 434
  - Erythrol tetra-nitrate in, I. 433
  - Ether in, I. 432, 433
  - Flatulent distension in, I. 427
  - Hypodermic injection of morphine in, I. 433
  - Iodides in, I. 430, 433
  - Iron in, I. 429
  - Leeches in, I. 434
  - Nitrites in, I. 425, 431—32
  - Nitro-glycerine in, I. 432
  - Pyridine in, I. 433
  - Quinine in, I. 430
  - Removal of gouty and other blood contamination in, I. 428
  - Strychnine in, I. 429
  - Symptoms of, I. 420
  - Treatment:
    - Indications for, I. 425—29
    - in the intervals, I. 429—31
    - in the paroxysms, I. 431—4
  - Valerianate of zinc in, I. 429
  - Vaso-motor spasm in, I. 421, 424
    - *See also* Additional Formulæ, I. 434—35
- Antipyrin in chorea, II. 389
  - in diabetes, II. 531
  - in epilepsy, II. 420
  - in headaches, II. 361
  - in influenza, II. 701, 706, 712
  - in meningitis, II. 261
  - in locomotor ataxy, II. 289
  - in neuralgia, II. 332, 336
  - in phthisis, II. 59
  - in pneumonia, I. 618
- "Anti-toxin serum" method in diphtheria, II. 592—95

Aortic insufficiency, I. 372—78
Alcohol in, I. 373, 377, 378
Chloralamide in, I. 378
Codeia in, I. 378
Digitalis in, I. 373—76
Dyspnœa in, I. 377
Food in, I. 373
Insomnia in, I. 377
Morphine in, I. 377—78
Nitrites in, I. 374, 378
Nitro-glycerine in, I. 375
Opium in, I. 377—78
Potassium iodide in, I. 376
Regurgitation in, I. 372—73
Rest in, I. 373, 376
Strychnine in, I. 378
Symptoms accompanying, I 373
Aortic stenosis, I. 370—71.
Digitalis in, I. 371
Iron in, I. 371
Nitro-glycerine in, I. 371
Potassium iodide in, I. 371
Regiminal measures in, I. 371
Sodium nitrite in, I. 371
Aortic strain, I. 419, 423
Aphonia, Hysterical, II. 442—43
Electricity in, II. 442
Valerianate of zinc in, II. 443
Aphthæ. *See* Stomatitis, Vesicular, I. 3—5; *also* Stomatitis, Parasitic, I. 5—8.
Aphthous stomatitis. *See* Stomatitis, Vesicular, I. 3—5
Apoplexy, II. 263—75
Blood-letting in, II. 268
Causation of, II. 263
Diet in, II. 271, 273
Electricity in, II. 272, 274
Embolic cases, II. 271
Enema in, II. 269
from cerebral hæmorrhage II. 264
Hæmostatics in, II. 270
Hemiplegia in, II. 271, 272—74
Mercurial inunction in, II. 271
Muscular rigidity and contraction in, II. 272
Nature of, II. 263
Potassium iodide in, II. 271
Preventive measures, II. 266, 274
Purgatives in, II. 269
Recovery from the attack, II. 271
Rectal feeding in, II. 270
Relation to chronic renal disease, II. 264
Stage of reaction in, II. 270
Surgical proposals for treatment, II. 275
Symptoms, II. 265
Syphilitic cases, II. 271
Thermal treatment, II. 274
See also Additional Formulæ, II. 282
Appendicitis, I. 242—253
Abdominal belt in, I. 253
Aperients in, I. 250
Causes of, I. 244
Constipation in, I. 246
Enemata in, I. 246
Operation in, I. 247, 251
Opium in, I. 246
Preventive measures, I. 252
Salol in, I. 251
Symptoms, I. 245, 246
Tonic in, I. 250
Treatment, I. 245, 246
Aristol in chronic nasal catarrh, I. 511
in small-pox, II. 625
Arsenic in anæmias, I. 470, 473
in angina pectoris, I. 429
in arthritis deformans, II. 478
in asthma, I. 577—78
in chorea, II. 392
in chronic malarial dysentery, I. 264
in diabetes, II. 531
in enteralgia, I. 192
in Hodgkin's disease, I. 484
in influenza, II. 711
in intermittent fever, II. 725
in locomotor ataxy, II. 288
in malarial cachexia, II. 730
in malignant stricture of the œsophagus, I. 35
in neuralgia, II. 322, 336
in neuritis, II. 350
in phthisis, II. 47—48
in pulmonary emphysema, I. 597
in rheumatism, II. 466
Arteries, Diseases of the, I. 436—51. *See* Arterio-sclerosis, I. 436 40; *and* Aneurism, I. 440-51
Arterio-capillary fibrosis, I. 438
Arterio-sclerosis. I. 436—40
Ammonia in, I. 439
Causation of, I. 437
Diet in, I. 440
Iodides in, I. 439
Nature of, I. 436—37
Necessity for treatment in early stages of, I. 438
Nitro-glycerine in, I. 440
Potassium bicarbonate in, I. 439
Waters in, I. 439—40
See also Additional Formulæ, I. 451
Arthritis deformans, II. 471—79
Anatomical characters of, II. 471—72
Arsenic (with iron) in, II. 478
Climate in, II. 478—79
Cod-liver oil in, II. 478
Counter-irritation in, II. 476

Arthritis deformans (*continued*)
Dietetic and hygienic treatment in, II. 478
Divergent views on the curability of, II. 473—74
Electricity in, II. 476
Etiology of, II. 473
Forms of, II. 472
Hot-air baths in, II. 476
Infectious origin of, II. 473
Iodine in, II. 476, 477
Massage in, II. 474
Quinine in, II. 478
Salicylates in, II. 477
Warm baths in, II. 475—76
Asafœtida in hysterical enteralgia, I. 191
in stricture of the œsophagus, I. 31
Ascaris lumbricoides, I. 284, 296–298
Calomel in, I. 298
Castor oil in, I. 297
Kamala in, I. 298
Natural history of, I. 296
Santonin in, I. 297
Symptoms, I. 297
Treatment, I. 297
See also Additional Formulæ, I. 305
Ascites—IN CARDIAC DISEASE, I. 318—21, 347, 348, 360, 363—68; II. 164—68
Caffeine in, I. 364
Calomel in, I. 365
Diaphoretics in, I. 364, 366
Diuretics in, I. 363, 364—66
Diuretin in, I. 365
Hydragogue cathartics in, I. 360, 363, 366
Incisions in, I. 366
Massage in, I. 368
Multiple punctures in, I. 367
Paracentesis abdominis in, I. 368
Potassium iodide in, I. 365
Saline purgatives in, I. 360
Strophanthus in, I. 364
IN HEPATIC DISEASE, II. 164—68
Diuretics and purgatives in, II. 166—67
Importance of early tapping in, II. 164–65
Procedure in paracentesis abdominis for, II. 165–66
Tonics in, II. 167
IN TUBERCULAR PERITONITIS, I. 318—21
Aspiration or tapping in, I. 319
Iodine in, I. 318
Iodoform in, I. 318
Laparotomy in, I. 319—21
Linimentum hydrargyri in, I. 319
Aspirin in acute rheumatism, II. 568
in arthritis deformans, II. 477
in diabetes, II. 532
in simple chronic articular rheumatism, II. 466
Asthma, I. 564—89
Adrenal substance in, I. 578
Ammonia vapour in, I. 574
Arsenic in, I. 577—78
Arsenical cigarettes in, I. 573
Associated with bronchial catarrh and emphysema, I. 585—86
Atropine in, I. 577
Belladonna in, I. 572—575
Bromide of potassium in, I. 576, 577
Bronchial glands a possible source of irritation, I. 579
Caffeine in, I. 573
"Carton fumigatoire" in, I. 572
Chloral hydrate in, I. 571
Chloroform in, I. 569
"Cigarettes d'Espic" in, I. 572
Climate in, I. 586—88
Cod-liver in, I. 588
Coffee in, I. 573
Conium in, I. 577
Diet in, I. 588
Electricity in, I. 579—80
Emetics in, I. 574
Essential condition in an attack of, I. 564
Ether in, I. 750
Euphorbia pilulifera in, I. 576
Forms of, I. 565
Frequent dependence on nasal and pharyngeal disease, I. 578—79
Fumigations in, I. 571—73
Grindelia in, I. 576
"Himrod's cure" in, I. 573
Hygiene measures in, I. 588
Hyoscine in, I. 577
Inhalations in, I. 569—71, 581
in the gouty, I. 585
Iodide of ethyl in, I. 570
Iodide of potassium in, I. 575, 577, 585
Ipecacuanha in, I. 574
Lobelia in, I. 576
Mont Dore cure in, I. 581
Morphine in, I. 568—69, 574
Nature of paroxysm in, I. 565—67
"Nervous element" in, I. 581—85, 587
Nitre paper fumes in, I. 571
Nitrite of amyl in, I. 570
Oxygen inhalations in, I. 581
Pathology of, 581—85
Pneumatic treatment of, I. 580
Pyridine in, I. 570—71
"Renal" cases, I. 581—82
Stramonium in, I. 572, 575

Asthma (*continued*)
  Strychnine in, I. 577
  Tobacco-smoking in, I. 571
    See also Additional Formulæ, I. 599—600
Ataxy, Locomotor (TABES DORSALIS), II. 284—96
  Antipyrin in, II. 289
  Anti-syphilitic remedies in, II. 287
  Aperients in, II. 290
  Arsenic in, II. 288
  Belladonna in, II. 290
  Bismuth in, II. 290
  Cannabis indica in, II. 290
  Causation, II. 286
  Chloride of gold in, II. 289
  Chloroform liniment in, II. 290
  Climate in, II. 294, 296
  Corrosive sublimate in, II. 289
  Counter-irritation in, II. 291
  Diet in, II. 295
  Electricity in, II. 291
  Ergot in, II. 289
  Exalgin in, II. 289
  Exercise in, II. 295
  Hydrotherapy in, II. 293
  Indications for treatment, II. 287
  Lightning pains in, II. 289
  Massage in, II. 295
  Mercury in, II. 287, 288
  Morphine in, II. 290
  Nitrate of silver in, II. 289
  Ortho-phosphate of silver in, II. 289
  Oxide of silver in, II. 289
  Phenacetin in, II. 289
  Potassium iodide in, II. 287, 288, 290
  Sodium salicylate in, II. 290
  Suspension in, II. 292
  Symptoms, II. 284—86
  Syphilis in causation of, II. 286
    See also Additional Formulæ, II. 816, 817
Atheroma. *See* Arterio-sclerosis, I. 436—40
Atheromatous ulcer, I. 437
Atrophic rhinitis. *See* Nasal Catarrh, Chronic, I. 509—12
Atrophy, Progressive muscular, II. 315—16
Atropine in aneurism, I. 451
  in asthma, I. 577
  in enteralgia, I. 188
  in epilepsy, II. 422
  in gall-stones, II. 113
  in gastric cancer, I. 98
  in hysteria, II. 441
  in intestinal obstruction, I. 275
  in malarial fevers, II. 728
  in neuralgias, II. 329, 343, 344
  in pain of aortic aneurism, I. 451
Atropine in phthisis, II. 63
  in pleurisy, I. 670
  in tetanus, II. 734
  in whooping-cough, II. 607

BACILLUS of cholera, II. 740
  of diphtheria, II. 578
  of influenza, II. 707
  of malarial fever, II. 714
  of tetanus, II. 730
  of tubercle, I. 680
  of typhoid fever, II. 627
  of whooping-cough, II. 601
Balsams in bronchial catarrh, I. 544, 549
Basedow's disease. *See* Exophthalmic goitre, I. 487—95
Bed-sores, Prevention of, in paraplegia, II. 309, 310
Belladonna in asthma, I. 572, 575
  in constipation, I. 212—13
  in enteralgia, I. 187, 188, 189
  in epilepsy, II. 417—18
  in exophthalmic goitre, I. 493
  in gall-stones, II. 114, 115
  in intestinal obstruction, I. 276, 280
  in mercurial stomatitis, I. 12
  in neuralgia, II. 330
  in phthisis, II. 63, 67
  in spasmodic stricture of the œsophagus, I. 31
  in tabes, II. 290
  in whooping-cough, II. 607
Benzoate of soda in chronic nasal catarrh, I. 512
  in diphtheria, II. 590
  in whooping-cough, II. 606
Benzoin in bronchial catarrh, I. 540
Beri-beri, II. 349
Biliary calculi. *See* Gall-stones, II. 103—24
Biliary cirrhosis. *See* Hepatitis, Chronic interstitial, II. 155—70
Bismuth in cholera, II. 748, 752
  in chronic gastric catarrh, I. 55, 56
  in diarrhœa, I. 228—29, 237
  in dysentery, I. 263
  in dyspepsia, I. 165, 166
  in gastralgia, I. 149
  in influenza, II. 710
  in simple catarrhal stomatitis, I. 2
  in tabes, II. 290
  in ulcer of the stomach, I. 77
  in vesicular stomatitis, I. 4
Bleeding in apoplexy, II. 268
  in Bright's disease, II. 228, 234
  in bronchial catarrh, I. 530
  in chronic valvular disease, I. 358—59
  in pneumonia, I. 620

Blood, Diseases of the. *See* Addison's disease, I. 485, 486; Anæmia, I. 453—77; Exophthalmic goitre, I. 487—95; Hodgkin's disease, I. 482—85; Leukæmia, I. 478—82; Myxœdema, I. 415—500
Bone-marrow in pernicious anæmia, I. 473, 474
Borax in chronic gastric catarrh, I. 53
  in chronic pharyngeal catarrh, I. 26
  in diphtheria, II. 587
  in epilepsy, II. 417
  in mercurial stomatitis, I. 12
  in parasitic stomatitis, I. 7
  in simple catarrhal stomatitis, I. 3
  in small-pox, II. 622
  in tonsillitis, I. 17
Boric acid in diphtheria, II. 587
  in gastro-ectasis, I. 118
  in scarlatinal otitis media, II. 638
  in small-pox, II. 622
  in typhoid fever, II. 674
  in ulcerative stomatitis, I. 9
  in vesicular stomatitis, I. 4
Bothriocephalus latus, I. 284, 286, 287, 289
Brachycardia, or Bradycardia, I. 406, 410
Brain and its coverings, Diseases of the. *See* Apoplexy, II. 263—75; Meningitis, II. 253—62; Tumour, Cerebral, II. 275—82
Bread for diabetics, II. 523—24
Bright's disease, Acute (ACUTE NEPHRITIS), II. 233—36
  Aconite in, II. 230
  Alkaline drinks in, II. 232
  Ammonia-citrate with sodium bromide in, II. 236
  Anæmia in, II. 235
  Blood-letting in, II. 228, 234
  Caffeine in, II. 232, 235
  Cardiac dilatation in, II. 235
  Causation of, II. 223—24
  Chloral and bromide of potassium, in, II. 235
  Chloroform inhalations in, II. 234
  Climate in, II. 236
  Convalescence in, II. 225, 235—36
  Diaphoretics in, II. 230, 234—35
  Digitalis in, II. 232, 235
  Diuretics in, II. 232—33
  Dropsy in, II. 225, 226, 233
  Elaterium in, II. 234
  Forms of, II. 224
  Free use of fluids in, II. 227
  Hot-air baths in, II. 229—30
Bright's disease, Acute (*continued*)
  Hot baths in, II. 228—29
  Indications for treatment, II. 225—26
  Iron tonics in, II. 236
  Local measures in, II. 227—28
  Milk diet in, II. 226—7
  Nitro-glycerine in, II. 232
  Nutrient enemata in, II. 233
  Organotherapy in, II. 233
  Oxygen inhalation in, II. 235
  Physical changes in the kidneys in, II. 224
  Pilocarpine in, II. 230—31, 234—35
  Potassium iodide in, II. 233
  Purgatives in, II. 231
  Sodium nitrite in, II. 232
  Strophanthus in, II. 232
  Symptoms of, II. 224—25, 233
  Uræmia in, II. 234—35
  Vomiting in, II. 233
  Wet pack in, II. 229
    See also Additional Formulæ, II. 251—52
Bright's disease, Chronic, II. 236—251
I. CHRONIC PARENCHYMATOUS NEPHRITIS, II. 236—44
  Alkaline waters in, II. 241
  Caffeine in, II. 241
  Cause of, II. 236
  Climate in, II. 244
  Dietetic and regiminal measures in, II. 239—41, 243—44
  Digitalis in, II. 241
  Diuretics in, II. 241
  Dropsy in, II. 242
  Hot baths in, II. 243
  Indications for treatment, II. 237—38
  Milk diet in, II. 238—39, 240
  Nitro-glycerine in, II. 242
  Oxygen inhalations in, II. 238
  Saline aperients in, II. 242
  Symptoms of, II. 237
II. CHRONIC INTERSTITIAL NEPHRITIS, II. 244—51
  Aperients in, II. 247
  Baths in, II. 247, 248
  Blood-letting in, II. 250
  Caffeine in, II. 250
  Causation of, II. 244
  Chloral in, II. 250
  Chloralamide with sodium bromide in, II. 250
  Chloroform inhalations in, II. 249
  Climate in, II. 248
  Hyoscine hydrobromide in, II. 251
  Indications for treatment, II. 246

Bright's disease: CHRONIC INTERSTITIAL NEPHRITIS (*continued*)
Iron in, II. 249
Milk diet in, II. 246
Mineral waters in, II. 247
Morphine in, II. 251
Nitrate of pilocarpine in, II. 250
Nitrite of amyl in, II. 249
Nitro-glycerine in, II. 248, 249
Opium in, II. 250—51
Potassium iodide in, II. 248
Regiminal and dietetic measures in, II. 246—48
Renal extracts in, II. 250
Strychnine in, II. 249
Symptoms of, II. 244
See also Additional Formulæ, II. 251—52
Bromide in chorea, II. 393—94
in epilepsy, II. 407, 410—16
in exophthalmic goitre, I. 492—93
in headaches, II. 359, 360, 361, 367
in hysteria, II. 485
in insomnia, I. 370, 374, 377, 378, 408
in neuralgia, II. 324
in palpitation, II. 408, 409, 410
in whooping-cough, II. 607
Bromoform in whooping-cough, II. 606
Bronchial asthma. *See* Asthma, I. 564—89
Bronchial catarrh, Acute, I. 524—38
GRAVER FORMS, I. 529 - 39
Aperients in, I. 532
Bleeding in, I. 530
Counter-irritation in, I. 530
Dangers of opium in, I. 532, 533
Diaphoretics in, I. 531
Diet in, I. 538
Dry-cupping in, I. 530
Emetics in, I. 535, 536
Enema in, I. 538
Expectorants in, I. 534
Inhalations in, I. 536, 537, 538
Leeches in, I. 530
Lobelia in, I. 537
Pinol in, I. 533
Poultices in, I. 530
Quinine in, I. 536, 537
Sprays in, I. 534, 535
Stimulants in, I. 537
Strychnine in, I. 537
Tartarised antimony in, I. 531
MILD FORMS, I. 525—29
Aconite in, I. 527
Alkaline waters in, I. 526
Aperients in, I. 528
Codeine in, I. 527
Diaphoretics in, I. 26

Bronchial catarrh, Acute
MILD FORMS (*continued*)
Expectorants in, I. 527, 528, 529
Opium in, I. 526
Poultices in, I. 528
Prophylactic measures in, I. 524
Tartarised antimony in, I. 526
See also Additional Formulæ, I. 539
Bronchial catarrh, Chronic I. 540—61
Ammoniacum in, I. 549
Aperients in, I. 544, 561
Balsams in, I. 544, 549
Baths in, I. 550, 552
Benzoin in, I. 549
Climate in, I. 557—58
Codeia in, I. 544
Cod-liver oil in, I. 551
Copaiba in, I. 544
Counter-irritation in, I. 555
Creasote in, I. 547, 548, 552
Emetics in, I. 554
Etiology, I. 540
Expectorants in, I. 549—54
Gum-resins in, I. 544, 549
Indications for treatment of, I. 542
Inhalations in, I. 547, 549, 550
Intra-tracheal injections in, I. 552
Manual compression in, I. 554
Menthol in, I. 549
Mineral waters in, I. 543, 558—60
Myrtol in, I. 550
Pneumatic treatment, I. 556
Potassium iodide in, I. 544
Quillaja in, I. 547
Respirators in, I. 545
Santal oil in, I. 550
Senega in, I. 553
Sprays in, I. 552, 553
Squill in, I. 549
Storax in, I. 549
Tar in, I. 546, 547
Tartarised antimony in, I. 543
Tonics in, I. 551
Turpentine and its derivatives in, I. 544, 545, 546, 555
Varieties, I. 541
Winter cough in, I. 541
See also Additional Formulæ, I. 561—63
Bronchial catarrh, Dry, I. 543
Bronchiectasis, I. 550, 552
Bronchitis putrida, I. 550, 551
Bronchorrhœa, I. 552 553
"Bulbar" paralysis, II. 316

CACTUS GRANDIFLORUS in cardiac disease, I. 355
in exophthalmic goitre, I. 493

Caffeine in asthma, I. 573
  in Bright's disease, II. 232, 235, 241
  in cardiac disease, I. 353—54
  in dropsical effusions, I. 364
  in headaches, II. 361
  in pleurisy, I. 650
  in pneumonia, I. 639
Calomel in apoplexy, II. 269
  in cholera, II. 749, 750, 751
  in chronic valvular disease, I. 362
  in constipation, I. 211
  in diarrhœa, I. 225, 233
  in dyspepsia, I. 170
  in gastric catarrh, I. 48, 59
  in hepatic congestion, II. 146
  in neuritis, II. 346
  in tonsillitis, I. 15
  in typhoid fever, II. 677
Camphor in acute nasal catarrh, I. 507
  in cholera, II. 749, 756
  in phthisis, II. 40
  in scarlet fever, II. 636
  in small-pox, II. 615
  in spasmodic stricture of the œsophagus, I. 31
Camphoric acid in phthisis, II. 63
Cancrum oris. *See* Stomatitis, Gangrenous, I. 10—11
Cannabis indica in epilepsy, II. 419
  in gastralgia, I. 149
  in locomotor ataxy, II. 290
  in neuralgia, II. 320, 336
Carbolic acid in cholera, II. 747
  in gangrenous stomatitis, I. 11
  in parasitic stomatitis, I. 7
  in phthisis, II. 39, 40
  in pneumonia, I. 633
  in scarlet-fever, II. 633, 637
  in small-pox, II. 615, 623, 625, 626
  in tetanus, II. 734
  in ulcerative stomatitis, I. 9
  in vomiting, I. 135, 136
  in whooping-cough, II. 602
Cardiac degeneration, I. 389—401
  FATTY DEGENERATION, I. 389—93
    Alcohol in, I. 391
    Anginal attacks in, I. 390, 391
    Aperients in, I. 392
    Codeia in, I. 393
    Diet in, I. 391
    Digitalis in, I. 390
    Insomnia in, I. 393
    Morphine in, I. 393
    Opium in, I. 393
    Oxygen inhalations in, I. 391
    Pepsine in, I. 393
    Preparations of iron in, I. 392
    Regiminal treatment, I. 391—92
    Sodium iodide in, I. 393
    Strychnine in, I. 391
Cardiac degeneration (*continued*)
  FATTY OVERGROWTH, I. 393—401
    Causes of, I. 394
    Diet in, I. 394—95
    Oertel's cure, I. 395—96
    Schott (or Nauheim) cure in, I. 396—99, 400—1
    Waters in, I. 395
    See also Additional Formulæ, I. 400
Cardiac dilatation, I. 343, 372, 383—89
  Aperients in, I. 388
  Causation of, I. 383—85
  Hypodermic injection of strychnine in, I. 387
  Leeches in, I. 388
  Mercurial purgatives in, I. 388
  Regiminal treatment in, I. 385—88
  Tonics in, I. 386—87, 389
    See also Additional Formulæ, I. 400
Cardiac dropsy. *See* Ascites, I. 363—68
Cardiac hypertrophy, I. 342—43, 372, 380—83
  Cardiac sedatives in, I. 382
  Causation, I. 342, 380—81
  Diet in, I. 382
  "Grape cure" in, I. 382
  in aortic insufficiency, I. 372
  Regiminal treatment in, I. 382
  Symptoms of, I. 381
  "Whey Cure" in, I. 382
    See also Additional Formulæ, I. 399
Cardiac liver, II. 148
Cardiac neuroses, I. 402—35
  Angina pectoris, I. 419—34
  Cardiac pain, I. 410—19
  Palpitation, I. 402—10
    See also Additional Formulæ, I. 434—35
Cardiac pain, I. 410—19
  Ammonia in, I. 415
  Ammonio-citrate of iron in, I. 413, 415, 417, 418
  Belladonna and chloroform liniment in, I. 417, 418
  Calumba in, I. 413, 417, 418
  Counter-irritation in, I. 413, 414, 415, 416, 418
  Digitalis in, I. 413, 414, 415, 417
  Ether in, I. 415
  Hypodermic injection of morphine in, I. 415
  Nitrite of amyl in, I. 416
  Painful spots in, I. 412—19
  Potassium bromide in, I. 418
  Rest in, I., 415, 416
  "Sub-mammary pain," I. 411
Cardiac strain, I. 384

- **Cardiac valvular lesions,** 340—57
  - Dilatation of the heart in, I. 343
  - General therapeutic indications, I. 340
  - Hypertrophy of the heart in, I. 342
  - Mechanical effects and consequences of, I. 341—42
  - COMPENSATED CASES OF, I. 343—46
    - Arsenic in, I. 345
    - Baths in, I. 345
    - Climate in, I. 345
    - Constipation in, I. 345
    - Diet in, I. 345
    - Digitalis in, I. 345
    - Drugs in, I. 343, 345
    - Iron in, I. 345
    - Mode of life in, I. 344
    - Sodium bromide in, I. 345
  - NON-COMPENSATED CASES OF, I. 346—57
    - Adonis vernalis in, I. 355
    - Arterial relaxants in, I. 356
    - Cactus grandiflorus in, I. 355
    - Caffeine in, I. 353—54
    - Coca in, I. 356
    - Convallamarine in, I. 355
    - Convallaria in, I. 355
    - Digitalin in, I. 351
    - Digitalis in, I. 349—52
    - Diuretin in, I. 354
    - in aortic valve disease, I. 347—48
    - in lesion of the mitral valve, I. 346 - 47
    - Indications for treatment of, I. 348—49
    - Iron in, I. 356
    - Kola in, I. 356
    - Mercurial aperients in, I. 356—57
    - Nativelle in, I. 351
    - Quinine in, I. 356
    - Rest and diet in, I. 349
    - Sparteine in, I. 355
    - Strophanthus in, I. 353
    - Strychnine in, I. 356
    - Symptoms of, I. 346—47
    - *See also* Additional Formulæ, I. 357
- "Carton fumigatoire" in asthma, I. 572
- Cascara in constipation, I. 213—14
- **Catarrhus æstivus.** *See* Hay Fever, I. 589—94
- **Catarrh, Laryngeal.** *See* Laryngeal catarrh, I. 512—22
- Cauterisation in gangrenous stomatitis, I. 10, 11
  - in mercurial stomatitis, I. 12
- **Cerebral hæmorrhage.** *See* Apoplexy, II. 263
- **Cerebro-spinal fever,** II. 757—6
  - Complications and sequelæ of II. 759
  - Diagnostic methods in, II. 760
  - *Diplococcus intracellularis* in causation of, II. 757
  - Forms of, II. 758, 759
  - Malignant, II. 758
  - Predisposing causes of, II. 758
  - Treatment of, II. 760—62
- Charcoal in flatulence of gastric cancer, I. 92; of dyspepsia, I. 166
- "Chelsea Pensioner," Composition of, II. 492
- Chloral in asthma, I. 571
  - in Bright's disease, II. 235, 250
  - in chorea, II. 394
  - in convulsions of measles, II. 644
  - in delirium of pneumonia, I. 638
  - in epilepsy, II. 419, 421
  - in gall-stones, II. 114
  - in hysteria, II. 435—36
  - in insomnia, I. 370, 374, 378
  - in insomnia of small-pox, II. 623
  - in neuralgia, II. 330
  - in pneumonia, I. 622
  - in tetanus, II. 738
  - in whooping-cough, II. 608
- Chloralamide in insomnia, II. 375
- Chloralose in insomnia, II. 376
- Chloride of gold in locomotor ataxy, II. 289
- Chloride of zinc in chronic pharyngeal catarrh, I. 25
- Chlorinated soda in gangrenous stomatitis, I. 11
- Chlorine in typhoid fever, II. 674—77
- Chlorobrom in sea-sickness, I. 138
- Chloroform in angina pectoris, I 432—33
  - in asthma, I. 569
  - in Bright's disease, II. 234
  - in chorea, II. 395
  - in gall-stones, II. 114
  - in gastralgia, I. 146
  - in hysteria, II. 440
  - in influenza, II. 709, 710
  - in insomnia, II. 377
  - in locomotor ataxy, II. 290
  - in neuralgia, II. 330—31
  - in phthisis, II. 30, 37, 38, 88, 89
  - in pneumonia, I. 623
  - in renal colic, II. 213
  - in whooping-cough, II. 607, 608
- **Chlorosis,** I. 456—7
  - Causes and symptoms, I. 456, 457
  - Digitalis in, I. 471
  - Iron in, I. 463
  - Treatment, I. 458
    - *See also* Additional Formulæ, I. 476, 477

Cholelithiasis. *See* Gall-stones, Treatment of, II. 103—24
Cholera, II. 739—57
Bismuth in, II. 748, 752
β-naphthol in, II. 752
Calomel in, II. 749, 750, 751
Castor oil in, II. 749, 750
Chloroform and camphor in, II. 749
Chloroform in, II. 752
"Cholera sicca," II. 742
Cholerine, II. 743
"Comma vibrio" in evacuations, II. 743
Course and symptoms, II. 740
Cramps in, II. 743, 756
Diffusion of infection of, II. 739
Disinfectants, II. 747 and note
Hot baths in, II. 756
Indications for treatment, II. 748
Injections of solutions of tannin in, II. 753
Intestinal antiseptics in, II. 751 54
Microbic origin of, II. 739
Opium in, II. 747, 750
Prophylactic measures against, II. 745
Purgatives in, II. 749, 757
Quinine in, II. 753
Salol in, II. 751
Stages of, II. 740—42
Subcutaneous injections in, II. 754—56
Thirst in, II. 742, 756
Thymol in, II. 753
Tribromophenol in, II. 752
Typhoid state, II. 743
Vaccination for, II. 744
Vomiting in, II. 743, 756
Chorea, II. 384—96
Alcohol in, II. 396
Antipyrin in, II. 389
Arsenic in, II. 392
Baths and douches in, II. 390, 395
Bromides in, II. 393—94
Cacodylate of sodium in, II. 392
Cardiac tonics in, II. 396
Causation of, II. 387—88
Chloralamide in, II. 394
Chloral in, II. 394
Chloroform in, II. 395
Cimicifuga in, II. 393
Conium in, II. 393
Diet in, II. 388, 390
Drugs to be avoided in, II. 388, 389
Electricity in, II. 391
Ether sprays in, II. 395
Exalgine in, II. 389
Gymnastics and massage in II. 391
Chorea (*continued*)
Hyoscyamus and hyoscine in, II. 393
Indications for treatment of, II. 388, 395—96
Insomnia in, II. 393—95
Morphine in, II. 394—95
Nature and characteristic symptoms of, II. 384—85
Opium in, II. 394—95
Quinine in, II. 389, 396
Relation to acute rheumatism, endocarditis, &c., II. 385—87
Rest in, II. 388, 390
Sodium salicylate in, II. 388
Strychnine in, II. 389, 396
Sulphonal in, II. 394
Trional in, II. 394
Zinc compounds in, II 392—93
See also Additional Formulæ, II. 400
Chronic valvular disease, I. 358, 378
Aortic insufficiency in, I. 372—78
Aortic stenosis in, I. 370—1
Bleeding in, I. 358—59
Bronchial catarrh in, I. 361
Cerebral congestion in, I. 368—70
Cough in, I. 362
Dropsy in, I. 360, 363—68
Dyspnœa in, I. 361
External applications in, I. 361
Gastric symptoms in, I. 362—63
Hæmoptysis in, I. 361
Leeches in, I. 359
Purgatives in, I. 359—61
See also Additional Formulæ, I. 379
Chyluria, II. 201—3
Astringents in, II. 202
Catheterisation in, II. 202
Gallic acid in, II. 202
Origin of, II. 202
Prophylaxis, II. 202
Thymol in, II. 202
Cinchonidine in malarial fever, II.
Cirrhosis of liver. *See* Hepatitis, Chronic interstitial, II. 155—69
Climatic Resorts:
for anæmic patients, I. 460
for asthmatic patients, I. 587—88
for ataxic patients, II. 294—95, 296
for cardiac patients, I. 345
for cases of Bright's disease, II. 236, 244, 248
for cases of chronic bronchial catarrh, I. 557—58
for cases of chronic laryngeal catarrh, I. 518, 520
for cases of chronic pleurisy, I. 650
for cases of dysentery, I. 266

Climatic Resorts (*continued*)
  for cases of exophthalmic goitre, I. 489
  for cases of gout, II. 510
  for cases of Hodgkin's disease, I. 484
  for cases of liver disease, II. 145, 147
  for cases of nasal catarrh, I. 504
  for consumptives, II. 1—23, 98—102
  for diabetic patients, II. 528
  for rheumatic patients, II. 458, 478
    See also list of Mineral Waters, II. 788—90
Cocaine in acute œsophagitis, I. 29, 30
  in acute pharyngitis, I. 22
  in angina pectoris, I. 430
  in cancer of the stomach, I. 94
  in gastralgia, I. 149
  in hay-fever, I. 592
  in neuralgia, II. 333, 336, 339
  in phthisis, II. 87, 88
  in scarlatinal otitis media, II. 637
  in sea-sickness, I. 137, 138
  in stricture of the œsophagus, I. 31
  in tonsillitis, I. 17
  in ulcerative stomatitis, I. 9
  in ulcer of the stomach, I. 79
  in vomiting, I. 135, 138, 140
  in whooping-cough, II. 608
Coccygodynia. *See* Neuralgia, II. 343
Cod-liver oil in arthritis deformans, II. 478
  in chronic bronchial catarrh, I. 551
  in emphysema, I. 597
  in neuralgia, II. 323
  in pharyngitis, I. 25
  in phthisis, II. 49, 50
  in scarlatinal otitis media, II. 638
  in secondary anæmia, I. 459
  in ulcerative stomatitis, I. 9
Codeia in acute laryngeal catarrh, I. 513
  in cardiac disease, I. 369, 393
  in chronic bronchial catarrh, I. 544
  in diabetes, II. 529
Codeina in cough of phthisis, II. 68
Codeine in bronchial catarrh, I. 527
Coffee in asthma, I. 573
  in cardiac failure, I. 625
Colchicum in gout, II. 489—91, 503, 504
  in rheumatism, II. 466
Colic. *See* Enteralgia, I. 183—97
Colica flatulenta, I. 184
Colica rheumatica, I. 184
Colica stercoacea, I. 184
Colica verminosa, I. 184
Colitis. *See* Dysentery, I. 253—66
Condurango bark in cancer of the stomach, I. 95—96
Congestion of the liver. *See* Liver, Hyperæmia of the, II. 142—48
Conium in asthma, I. 577.
  in chorea, II. 393
Constipation, Habitual, I. 199—215
  Aperients in, I. 207, 213
  Associated with biliousness, I. 211
  Belladonna in, I 212—13
  Calomel in, I. 211
  Cascara in, I. 213—14
  Castor oil in, I. 207
  Causation of, I. 199—202
  Cholagogues in, I. 211
  Diet in, I. 203—5
  "Dinner pill" in, I. 211.
  Douches in, I. 206
  Electricity in, I. 206—7
  Enemata in, I. 208—10
  Glycerine in, I. 210—11
  "Grape cure" in, I. 205
  Healthy habits in, I. 205—7
  Hypodermic injections in, I. 215
  Indications for treatment of, I. 203
  in women, I. 201—2
  Linseed in, I. 205
  Massage in, I. 205—6
  Medicinal measures in, I. 207—17
  Nux vomica in, I. 213, 214
  Olive oil in, I. 209
  Opium in, I. 213
  Podophyllin in, I. 211
  Sodium phosphate in, I. 212
  Sodium sulphate in, I. 207
  Strychnine in, I. 214
  Sulphates in, I. 212, 215
  Symptoms of, I. 202—3
  Tonics in, I. 214
  Waters in, I. 204, 212
    See also Additional Formulæ, I. 215—17
Constitutional diseases. *See* Arthritis deformans, II. 471—79; Diabetes, II. 513—40; Gout, II. 481—512; Rheumatism, II. 456—71, 556—75
Consumption, Pulmonary. *See* Phthisis, I. 674—97, II. 1—102
Convallaria in cardiac disease, I. 355
Corrosive sublimate in laryngeal diphtheria, II. 591
  in locomotor ataxy, II. 289
  in nasal diphtheria, II. 591
  in simple catarrhal stomatitis I. 8
  in typhoid fever, II. 666, 674

- **Coryza.** *See* Nasal catarrh, Acute, I. 502—9
- **Coryza vasomotoria.** *See* Hay fever, I. 589—94
- Coto bark in diarrhœa, I. 230—31
- **Cough** in cardiac disease, I. 362
  - in chronic bronchial catarrh, I. 542—43
  - in phthisis, II. 64—70
  - in pneumonia, I. 622—23
- **Cramp of the stomach.** *See* Gastralgia, I. 141—51
- Creasote in Bright's disease, II. 233
  - in bronchial catarrh, I. 522, 547, 548
  - in cancer of the stomach, I. 92, 93
  - in chronic gastric catarrh, I. 54, 55
  - in chronic valvular disease, I. 363
  - in dilatation of the stomach, I. 113
  - in enteralgia, I. 191, 192
  - in jaundice, II. 136
  - in mercurial stomatitis, I. 12
  - in phthisis, II. 30, 33—38, 81, 82
  - in stricture of the œsophagus, I. 84
  - in ulcer of the stomach, I. 79
  - in vomiting, I. 136, 139
- Croton-chloral in neuralgia, II. 331
- Croton oil in apoplexy, II. 269
- Cupric sulphate in parasitic stomatitis, I. 7
  - in vesicular stomatitis, I. 5
- **Cystitis,** II. 220—21
  - Checking decomposition of the urine in, II. 221
  - Irrigation of the bladder in, II. 221
  - Postponing and preventing alkaline fermentation in, II. 221
    - *See also* Additional Formulæ, II. 221—22

- **Diabetes,** II. 513—40
  - Characters of urine in, II. 518
  - Clinical characters, II. 515
  - Definition and nature of, II. 513
  - Diet in, II. 519, 520—27, 537—40
    - Albuminates and fats in, II. 521
    - Aleuronat bread in, II. 524
    - Beverages in, II. 526, 540
    - Bran biscuits in, II. 523
    - Casein biscuits in, II. 525
    - Ergon in, II. 525
    - Gluten bread in, II. 523
    - Meat, fish, and fruits in, II. 522, 525
    - Milk in, II. 522
    - Protein flour in, II. 524
    - Roborat in, II. 525
    - Soya biscuits in, II. 524
    - Torrified bread in, II. 523
  - Etiology, II. 520
  - Forms of, II. 515

- **Diabetes** (*continued*)
  - Glycogenic and sugar forming functions of the liver, II. 514, 515
  - Glycosuria in, II. 514
  - Medicinal treatment, II. 528—37
    - Alkalies in, II. 530, 536
    - Antipyrin in, II. 531
    - Arsenic in, II. 531
    - Codeia in, II. 529
    - Jambul in, II. 532
    - Morphia in, II. 529
    - Opiates in, II. 529
    - Opium in, II. 529
    - Potassium bromide in, II. 531
    - Salol in, II. 532
    - Sodium salicylate in, II. 532, 536
    - Sulphonal in, II. 532
    - Uranium nitrate in, II. 533
  - Mineral waters in, II. 527, 528, 535
  - Muscular exercise in, II. 521
  - Pancreatic, II. 516, 533
  - Symptoms, II. 517—20, 534—36
    - Coma in, II. 518, 536
    - Constipation in, II. 535
    - Cystitis in, II. 536
    - Dental caries in, II. 535
    - Excessive thirst in, II. 517, 534
    - Hunger in, II. 517, 535
    - Itching in, II. 517, 535
    - *See also* Additional Formulæ, II. 540
- **Diarrhœa,** I. 218—39
  - Acetate of lead in, I. 237
  - Alkaline medicines in, I. 225
  - Astringents in, I. 226, 228, 237, 239
  - Beer-yeast in, I. 236
  - Bismuth preparations in, I. 228—29, 237
  - β-naphthol in, I. 234
  - Calomel in, I. 225, 233
  - Castor oil in, I. 225
  - Causes of, I. 219—221
  - Chill in, I. 220
  - Compound powder of catechu in, I. 229—30
  - Dietetic treatment of, I. 221—24, 237
  - Eliminative forms of, I. 221
  - Enemata in, I. 227, 229, 234
  - Hydrochloric acid in, I. 235
  - Hypodermic injections in, I. 228
  - Ichthalbin in, I. 254
  - in infancy, I. 221, 235
  - Intestinal antiseptics in, I. 231—34
  - Intestinal irrigation in, I. 235, 239
  - Lactic acid in, I. 235
  - Liquor opii sedativus in, I. 229
  - Local irritation in, I. 219—20

Diarrhœa (*continued*)
  Medicinal treatment of, I. 224—41
  Microbic origin of endemic and epidemic cases, I. 220—21
  Milk in, I. 222, 223
  Morbid condition of the intestinal mucous membrane in, I. 220
  Nitrate of silver in, I. 238
  Opium in, I. 226—28, 237
  Oxide of zinc in, I. 237
  Peptones in, I. 237
  Pernitrate of iron in, I. 238
  Pulvis rino compositus in, I. 226—227
  Quinine in, I. 237
  Resorcin in, I. 234
  Rest treatment in, I. 223, 224, 237
  Salol in, I. 233
  Sulphate of copper in, I. 238
  Symptoms of, I. 221
  Tannin in, I. 229—30
  Tincture of coto bark in, I. 230—31
  Two forms of, I. 219
  Waters in, I. 223, 237, 239
    See also Additional Formulæ, I. 239—41
Digestion, Diseases of the organs of. *See* Appendicitis, I. 242—53; Ascaris lumbricoides, I. 284, 296—98; Bothriocephalus latus, I. 284, 286, 287, 289; Constipation, I. 199—217; Diarrhœa, I. 218—41; Dysentery, I. 253—67; Dyspepsia, I. 152—82; Enteralgia, I. 183—97; Gastralgia, I. 141—51; Gastric catarrh, I. 42—63; Gastro-ectasis, I. 102—23; Hæmatemesis, I. 124—32; Intestinal obstruction, I. 268—83; Œsophagitis, I. 29, 30; Œsophagus, stricture of the, I. 30—41; Oxyuris vermicularis, I. 298—303; Peritonitis, I. 306—24; Perityphlitis, I. 242, 243, 248—50; Pharyngeal catarrh, I. 19—28; Stomach, cancer of the, I. 84—100; Stomach, Ulcer of the, I. 64—82; Stomatitis, I. 1—13; Tonsillitis, I. 13—19; Vomiting, 132—41
Digitalis in acute endocarditis, I. 335, 337
  in aortic insufficiency, I. 373—76
  in apoplexy, II. 267
  in ascites of liver disease, II. 166, 167
  in Bright's disease, II. 232, 235, 241
  in cardiac valvular lesions, I. 349—52
Digitalis in chlorosis, I. 471
  in chronic valvular disease, I. 363
  in diphtheria, II. 590
  in epilepsy, II. 418
  in exophthalmic goitre, I. 492
  in hepatic congestion, II. 148
  in jaundice, II. 138
  in phthisis, II. 58, 61, 77
  in pneumonia, I. 617
  in typhoid fever, II. 691
Dilatation of the stomach. *See* Gastro-ectasis, I. 102—23
Diphtheria, II. 578—99
  a bacillary and a local disease, II. 578
  Antiseptic applications in, II. 586
  "Anti-toxin serum" method in II. 592—95
  Biniodide of mercury in, II. 590
  Complications of, II. 583
  Contagious character of, II. 579
  Convalescence from, II. 595
  Corrosive sublimate in, II. 591
  Diagnosis, II. 584
  Electricity in, II. 596
  Emetics in, II. 592
  Etiology, II. 579—81
  Food and stimulants in, II. 590
  Indications for treatment, II. 585
  Inhalations in, II. 591
  Intubation in, II. 592
  Irrigations in, II. 587
  Klebs-Löffler bacillus of, II. 578, 579, 584
  Laryngeal, II. 582, 591
  Local treatment, II. 586
  Massage in, II. 596
  Nasal, II. 588, 590
  Paralysis of, II. 584, 595
  Perchloride of iron in, II. 589
  Perchloride of mercury in, II. 589
  Prophylactic measures in, II. 597
  Pseudo-bacillus of, II. 579
  Sodium benzoate in, II. 589
  Strychnine in, II. 596
  Symptoms and course of, II. 581
  Tracheotomy in, II. 592
    See also Additional Formulæ, II. 610, 611
Dysentery, I. 253—266
  Acetate of lead in, I. 263
  Alcohol in, I. 259, 265
  Amœba coli in, I. 253
  Antiseptic irrigation in, I. 261
  Aperient sulphates in, I. 261
  Arsenic in, I. 264
  Bismuth in, I. 263
  Borax and bicarbonate of soda in, I. 261
  Castor oil in, I. 259
  Cause of, I. 253—54

Dysentery (*continued*)
  Chronic, I. 265
  Clinical varieties, I. 256
  Enemata in, I. 258, 260, 262
  Etiology of, I. 253—255
  Food in, I. 258, 259, 264, 265
  Hypodermic injections in, I. 265
  Indications for treatment of, I. 257—266
  Intestinal antisepsis in, I. 257, 259—263
  Iodine in, I. 262
  Ipecacuanha in, I. 259—61, 265
  Malarial cases of, I. 254, 264
  Massage in, I. 263
  Monsonia ovata in, I. 264
  Nitrate of silver in, I. 262, 264
  Opium in, I. 257, 258, 260, 261
  Prophylaxis, I. 266
  Quinine in, I. 262, 264
  Relations to malaria, I. 254
  Simaruba in, I. 264
  Sulphate of copper in, I. 263, 264
  Symptoms, I. 255, 256
  Tonics in, I. 265
    See also Additional Formulæ, I. 267
Dyspepsia, I. 152—182
  Alkalies in, I. 167
  Atonic, I. 153
  Bicarbonate of soda in, I. 165
  Bismuth in, I. 165, 166
  Bromide of sodium in, I. 172
  Calomel in, I. 170
  Capsicum tincture in, I. 164
  Castor oil in, I. 156
  Causal indication for treatment of, I. 153
  Charcoal in, I. 166
  Constipation in, I. 158
  Creasote in, I. 165
  Electricity in, I. 179
  Examination of contents of stomach in, I. 174—178
  Functional, I. 153
  Gastrodiaphany, I. 177
  Gastrograph, I. 177
  Giddiness in, I. 159
  Hydrochloric acid in, I. 164, 166
  Hydrotherapy in, I. 171
  Inflammatory. *See* Gastric catarrh, Acute, I. 42—49
  Influence of digestion in, I. 155
  Intestinal, I. 156, 170
  Lozenges in, I. 165
  Massage in, I. 171 (note), 180
  Menthol in, I. 165
  Mineral waters in, I. 168, 169
  Modern gastric methods, I. 173—180
  Nervous debility in, I. 171—73
  of early infancy, I. 155, 156
  Papain in, I. 172, 173

Dyspepsia (*continued*)
  Paroxysmal pyrosis in, I. 159, 160
  Pepsin in, I. 164, 172
  Potassium iodide in, I. 176
  Salol in, I. 176
  Secondary, I. 171
  Sodium bicarbonate in, I. 163, 166
  Strychnine in, I. 172
  Symptoms, I. 158, 159, 160
  Treatment:
    Dietetic, I. 160—162
    Medicinal, I. 163—173
    Regiminal, I. 162—163
  Valerianate of quinine with nux vomica in, 172
  Vanillin-phloroglucin test in, I. 175
  Vegetable bitters in, I. 163
    See also Additional Formulæ, I. 180—82

ELATERIUM in Bright's disease, II. 234
  in chronic valvular disease, I. 360
Electricity in apoplexy, II. 272, 274
  in arthritis deformans, II. 476
  in chorea, II. 391
  in chronic nasal catarrh, I. 512
  in constipation, I. 206—7
  in dilatation of the stomach, I. 113
  in dyspepsia, I. 179
  in enteralgia, I. 192
  in exophthalmic goitre, I. 491, 492
  in gastralgia, I. 147
  in Hodgkin's disease, I. 484
  in hydatid cysts, II. 176
  in hysteria, II. 438, 440—43
  in infantile paralysis, II. 301
  in jaundice, II. 134
  in leukæmia, I. 481
  in locomotor ataxy, II. 291
  in neuralgia, II. 326
  in neurasthenia, II. 448—49, 452—53
  in neuritis, II. 346, 351
  in paralysis, II. 398
  in paraplegia, II. 311
  in rheumatism, II. 462
  in stricture of the œsophagus, I 82
Embolism. *See* Apoplexy, II. 263
Emphysema, Interlobular, I. 595
Emphysema, Pulmonary, I. 596—98
  Causation of, I. 595
  Degrees of, I. 595
  Indications for treatment, I. 595—97

Emphysema, Pulmonary (*continued*)
Pneumatic treatment in, I. 598
Remedial measures in, I. 597
Tonic and hygienic measures in, I. 597
Emphysema, Vesicular, I. 595
Empyema. *See* Pleurisies with purulent effusions, I. 661—72
Endarteritis deformans. *See* Arterio-sclerosis, I. 436—40
Endocarditis, Acute, I. 331—37, 339
Alcohol in, 335
Alkalies in, I. 333—34
Cicatrisation in, I. 332
Convalescence in, I. 337, 339
Diet in, I. 333, 335
Digitalis in, I. 335, 337
Etiology of, I. 332
Indications for treatment, I. 332
Lavage in, I. 334
Micro-organisms in, I. 332
Minute vegetations in, I. 331—2
Opium in, I. 332
Potassium iodide in, I. 335, 336
Quinine in, I. 333, 334
Rest in, I. 335, 336
Salicin in, I. 333, 334
Salicylates in, I. 335
Sodium iodide in, I. 335—36
Endocarditis, Malignant, Ulcerative, or Infective, I. 337—39
Antiseptics in, I. 338
Anti-streptococcus serum in, I. 338, 339
Arsenic in, I. 338
Hypodermic injection of yeast in, I. 338
Mercuric chloride in, I. 338
Micro-organisms in, I. 337
Nuclein in, I. 338
Quinine in, I. 338, 339
Enteralgia (COLIC), I. 183—97
Alkalies in, I. 189
Aperients in, I. 189, 191
Arsenic in, I. 192
Atropine in, I. 188
Belladonna in, I. 187, 188, 189
Cajuput oil in, I. 191
Carminative mixture in, I. 189
Castor oil in, I. 187, 190
Causes of, I. 183—85
Constipation in, I. 185
Creasote in, I. 191, 192
Diet in, I. 192
Employment of the tube in, I. 190
Enemata in, I. 187, 188, 190, 191
External applications in, I. 191, 192
Flatulence in, I. 184, 191, 192
Galvanism in, I. 192
Enteralgia (*continued*)
Gouty cases of, I. 189
Hypodermic injections in, I. 188, 189
Hysterical cases of, I. 185, 191
Indications for treatment, I. 186
in infancy, I. 185, 189, 190
Intestinal worms in, I. 191
Ipecacuanha in, I. 190
Lead colic, I. 185, 186, 193—97
Liquor opii sedativus in, I. 188
Massage in, I. 192
Menthol in, I. 191, 192
Morphine in, I. 188
Neuralgic cases of, I. 192
Neurosal and reflex cases of, I. 184, 185
Oil of rue in, I. 190
Opium in, I. 187, 190
Pain in, I. 185, 186, 187, 188, 190
Puncture of the colon in, I. 192
Quinine in, I. 192
Rheumatic cases of, I. 184, 186, 191
Symptoms of, I. 185—86
Valerianate of zinc, I. 192
See also Additional Formulæ, I. 197—98
Enterotomy in intestinal obstruction, I. 280
Epilepsy, II. 401—24
Anæmic cases of, II. 408, 421
Antipyrin in, II. 420
Auræ in, II. 403—4
"Bechterew" treatment in, II. 418
Belladonna in, II. 417—18
Borax in, II. 417
Bromides in, II. 407, 410—16
Cannabis indica in, II. 419
Cardiac tonics in, II. 418
Causes of, II. 401—3
Chloral in, II. 419, 421
Coma in, II. 421
Complications of, II. 421—22
Dietetic and regiminal treatment II. 407—10, 420
Different forms of, II. 401
Inhalations in, II. 405, 406, 422
Injections in, II. 405, 406, 422
Nitrites in, II. 465, 406, 419, 422
Nitroglycerine in, II. 496, 419, 421
Paroxysmal stage in, II. 405
Phenomena of, II. 403—4
Pre-paroxysmal stage in, II. 405—7
"Salt starvation" in, II. 413
Status epilepticus in, II. 421
Strychnine in, II. 421, 422
Strumous cases of, II. 421
Surgical treatment of, II. 422—24
Symptoms of bromism in, II. 412—418

Epilepsy (*continued*)
  Syphilitic cases of, II. 402, 421
  Zinc compounds in, II. 418
    See also Additional Formulæ, II. 424—25
Ergot in aneurism, I. 448—49
  in apoplexy, II. 270
  in chronic pharyngeal catarrh, I. 26
  in headache, II. 360, 362
  in infantile paralysis, II. 299
  in locomotor ataxy, II. 289
  in paraplegia, II. 311, 315
  in phthisis, II. 63, 75, 76
Ergotin in apoplexy, II. 271
  in hæmatemesis, I. 129
  in hæmaturia, II. 198
  in hæmoptysis, II. 75—76
  in hæmorrhage of typhoid fever, II. 689
  in ulcer of the stomach, I. 80
Ergotinine in hæmatemesis, I. 130
  in hæmaturia, II. 198
  in hæmoptysis, II. 75—76
Ergotinine of Tanret in hæmoptysis, II. 75
Erysipelas, I. 645—53
  Antiseptics in, II. 651
  Clinical features and course, II. 645—48
  Complications of, II. 648
  Corrosive sublimate in, II. 651
  Diet in, II. 652
  Digitoxin in, II. 652
  Duration, II. 648
  Ichthyol in, II. 650
  Perchloride of iron in, II. 651
  Prophylaxis in, II. 649
  Quinine in, II. 651
  Serum treatment, II. 652
  Sodium salicylate in, II. 651
  Stimulants in, II. 652
  Tracheotomy in, II. 651
    See also Additional Formulæ, II. 656
Erythrol tetra-nitrate in angina pectoris, I. 483
  in aneurism, I. 450
Ether in pneumonia, I. 620, 621, 627
Ethyl iodide in asthma, I. 570
Eucalyptol in nasal diphtheria, II. 591
  in phthisis, II. 38
  in small-pox, II. 623
Eucalyptus in simple catarrhal stomatitis, I. 3
Eucalyptus oil in bronchial catarrh, I. 551
  in headache, II. 362
  in measles, II. 642
  in scarlet fever, II. 633
  in typhoid fever, II. 680
  in whooping-cough, II. 604
Euphorbia pilulifera in Asthma, I. 576
Exalgin in neuralgia, II. 333
  in tabes, II. 289
Exophthalmic goitre (GRAVES'S or BASEDOW'S DISEASE), I. 487—95
  Arsenious acid in, I. 493
  Belladonna in, I. 493
  Cactus grandiflorus in, I. 493
  Characters of, I. 487
  Coto tincture in, I. 494
  Course of, I. 487
  Diet, I. 490
  Digitalis in, I. 492
  Douches in, I. 490
  Electrical measures, I. 491, 492
  Enemata in, I. 493
  Hydrotherapy in, I. 490
  Hygienic measures in, I. 489, 490
  Hypodermic injections in, I. 495
  Ice-bag in, I. 491, 495
  Iron in, I. 492
  Medicinal treatment, I. 492—94
  Potassium bromide in, I. 493
  Quinine in, I. 493
  Sodium bromide in, I. 492
  Sodium phosphate in, I. 493
  Strophanthus in, I. 493
  Sulphuric acid in, I. 494
  Surgical measures in, I. 494, 495
  Symptoms, I. 487
  Thyroidectomy for, I. 494
  Valerianate of zinc in, I. 493
    See also Additional Formulæ, I. 501

Fatty cirrhosis of the liver, II. 157
Fatty degeneration of the heart. *See* Cardiac degeneration, I. 389—93
Fatty overgrowth of the myocardium. *See* Cardiac degeneration, I. 393—401
Faucher's stomach syphon, I. 115—19
Feeding by the rectum, General remarks on, I. 37—41
Ferratin in anæmia, I. 467
Fibroid degeneration of the heart, II. 389
Filix mas as a tæniacide, I. 291
Fistula in ano (in phthisis), II. 93—94

Gall-stones, II. 103—24
  Alkaline drinks in, II. 118
  Aperients in, II. 118
  Atropine in, II. 113
  Belladonna in, II. 114, 115
  Causes, II. 106
  Chloroform in, II. 114
  Cholagogues in, II. 119

Gall-stones (*continued*)
  Composition of, II. 105
  Diet in, II. 121
  Enema in, II. 116
  Etiology, II. 106—9
  Hydrate of chloral in, II. 114
  Hypodermic injections in, II. 118
  Indications for treatment, II. 112
  in intestinal obstruction, I. 272, 277, 282
  Leeches in, II. 115
  Local applications in, II. 114
  Manipulation of gall-bladder in, II. 117
  Mineral waters in, II. 120, 121
  Morphine in, II. 113, 114
  Olive oil in, II. 116
  Opium in, II. 114
  Podophyllin in, II. 115
  Sodium bicarbonate in, II. 115
  Sodium salicylate in, II. 115, 119
  Surgical interference for, II. 122—24
  Symptoms, II. 104, 109—12
  Turpentine in, II. 116, 117
    See also Additional Formulæ, II. 125
Gallic acid in chyluria, II. 202
  in hæmaturia, II. 198
  in hæmoptysis, II. 76
Gangrene of the lung, I. 641
Gastralgia, I. 141—150
  Albuminate of iron in, I. 145
  Arsenic in, I. 146
  Bismuth subnitrate in, I. 149
  Blaud's pills (modified) in, I. 145
  Cannabis indica in, I. 149
  Causation of, I. 142
  Chloroform in, I. 146
  Cocaine hydrochlorate in, I. 149
  Cocaine in, I. 149
  Electricity in, I. 147
  Ferrum redactum in, I. 135
  Hydrochloric acid in, I. 145
  Hydrocyanic acid in, I. 150
  Hydrotherapy in, I. 147
  Hysterical cases of, I. 146
  Indications for treatment of, I. 144
  Iron in, I. 145, 146
  Malarial cases of, I. 146
  Neuroses, I. 142
  Nitrate of silver in, I. 150
  Opium in, I. 148
  Quinine in, I. 146
  Strychnine in, I. 146
  Symptoms of, I. 143, 144
  Tonics in, I. 146
  Treatment, I. 148
  Valerianate of zinc in, I. 146
  Various forms of, I. 143, 144
    See also Additional Formulæ, I. 150, 151
Gastrectomy in cancer of the stomach, I 99—100
Gastric catarrh, Acute, I. 42—49
  Aperient in, I. 46
  Apomorphine in, I. 45
  Bicarbonate of soda in, I. 45
  Calomel in, I. 48
  Causation of, I. 42—43
  Cold compresses in, I. 47
  Diarrhœa in, I. 48
  Dietetic rules after recovery in I. 45, 48, 49
  Effervescing drinks in, I. 47, 48
  Emetics in, I. 45
  Enforcement of rest in, I. 46
  Eructations of gas in, I. 48
  Hypodermic injection of morphine in, I. 47
  Ipecacuanha in, I. 45, 48
  Leeches in I. 46—47
  Massage in, I. 45
  Nutrient enemata in, I. 46
  Opiates in, I. 47
  Opium in, I. 47
  Pepsin (with hydrochloric acid) in, I. 48
  Poultices in, I. 47
  Purgatives in, I. 45
  Removal of irritating substances in, I. 45, 46
  Syphon tube or stomach pump in, I. 45
  Symptoms of, I. 44
  Waters in, I. 45, 46
    See also Additional Formulæ, I. 62, 63
Gastric catarrh, Chronic, I. 49—62
  Advanced atrophic cases of, I. 58
  Alkalies in, I. 56—57
  Anæmic cases of, I. 57
  Aperients in, I. 58
  Argentic nitrate in, I. 56
  Bismuth in, I. 55, 56
  Bitters in, I. 56
  Calomel in, I. 59
  Causation of, I. 49
  Creasote in, I. 54, 55
  Dietetic management in, I. 59—62
  Emetics in, I. 53
  Hydrochloric acid in, I. 58
  Indications for treatment of, I. 52
  Intragastric faradisation in, I. 59
  Intragastric spray in, I. 56
  Lavage in, I. 53
  Mechanical emptying of the stomach in, I. 52
  Opium in, I. 56
  Pepsin in, I. 58
  Purgative waters in, I. 53
  Sodium bicarbonate in, I. 54, 57
  Symptoms of, I. 50—51
  Thymol in, I. 54, 55
  Turkish bath in, I. 59
    See also Additional Formulæ, 62, 63

Gastric neurosis. *See* Gastralgia, I. 141—51
Gastritis, Acute. *See* Gastric catarrh, Acute, I. 42—49
Gastritis, Chronic. *See* Gastric catarrh, Chronic, I. 49—62
Gastrodynia. *See* Gastralgia, I. 141—51
Gastro-ectasis, I. 102—123
  Abdominal bandage, I. 111
  Antiseptics in, I. 113
  Carlsbad water in, I. 112, 113
  Causes of, I. 102—104
  Condensed peptonised milk in, I. 109
  Constipation in, I. 105, 113
  Diet in, I. 108—9
  Emetics in, I. 111
  Exercise in, I. 114
  Hydrotherapy in, I. 114
  Indications for treatment, I. 107
  Lavage in, I. 107, 114—121
  Massage in, I. 113 (note)
  Model dietary in, I. 110, 111
  Nutrient enemata in, I. 110
  Operations in, I. 121—123
  Physical examination in, I. 106
  Purgatives in, I. 112
  Syphon and pump in I. 114—121
  Symptoms of, I. 104, 105
  Tonics in, I. 113, 114
  Vomiting in, I. 104, 105
    See also Additional Formulæ, I. 123
Gastro-enterostomy in cancer of the stomach, I. 98—99
Gastrostomy in cancer of the stomach, I. 97
  in stricture of the œsophagus, I. 85, 87
Gelatine in hæmaturia, II. 199
Gelsemium in neuralgia, II. 331, 336
Glycerine in acute nasal catarrh, I. 509
  in apoplexy, II. 269
  in chronic nasal catarrh, I. 511
  in constipation, I. 210—11
  in parasitic stomatitis, I. 7
  in phthisis, II. 50—51
  in scarlatinal otitis media, II. 637
Glycerine of borax in ulcerative stomatitis, I. 9
Glycerine of tannin in tonsillitis, I. 19
Gout, II. 481—511
  Acute articular, II. 481—82, 502—7
  a disorder of elimination, II. 488
  Alkalies in, II. 493—97
  Aperients in, II. 503, 504
  Blood state in, II. 483
  Cardio-vascular and renal changes in, II. 483
Gout (*continued*)
  Climate in, II. 510
  Clinical characters, II. 481
  Colchicum in, II. 489—91, 503, 504
  Diet and regiminal measures in, II. 505, 507—10
  Etiology of II. 488
  Exercise in, II. 510
  Guaiacum in, II. 491
  Indications for treatment, II. 489
  Iodide of potassium in, II. 592
  Lithium salts in, II. 496
  Mineral waters in, II. 497—501
  Neuralgic and cutaneous affections in, 483
  Opium in, II. 505
  Phenomena of irregular cases, II. 484, 485
  Piperazine in, II. 496
  Pistoja powders in, II. 507
  Salicylates in, II. 491, 504
  Sulphur springs in, II. 501
  Thermal springs in, II. 501
  Uratic deposits in, II. 483
  Warm lotion in, II. 504
  White mixture in, II. 497
    See also Additional Formulæ, II. 511, 512
Grand mal, II. 401, 410
Granular pharyngitis. *See* Pharyngeal catarrh, Chronic, I. 23—27
Grape cure in cardiac hypertrophy, I. 382
  in constipation, I. 205
Graves's disease. *See* Exophthalmic goitre, I. 487—95
Grindelia in asthma, I. 576
Guaiacol in phthisis, II. 33—36
Guaiacum in gout, II. 491
  in rheumatism, II. 466
  in tonsillitis, I. 16
Guarana in headache, II. 361
Gum resins in bronchial catarrh, I. 544, 549
Gum water in simple stomatitis, I. 2

Hæmatemesis, I. 124—32
  After-treatment of, I. 132
  Alum in, I. 130
  Artificial serum in, I. 131
  Causes of, I. 124, 125
  Diagnosis, I. 127, 128
  Ergotin in, I. 129
  Ergotinine in, I. 130
  Gelatine in, I. 131
  Local application in, I. 131
  Purgation in, I. 132
  Prophylaxis, I. 128
  Rectal food in, I. 129
  Styptics in, I. 130
  Sulphuric acid in, I. 130

Hæmatemesis (*continued*)
Symptoms of, I. 126, 127
Syncope in, I. 131
Tonics, I. 132
See also Additional Formulæ, I. 150
Hæmaturia, II. 195—99
Acetate of morphine in, II. 198
Acidulous drinks in, II. 197
Dry-cupping in, II. 198
Endemic and parasitic, II. 196
Ergotin and ergotinine in, II. 198
Etiology, II. 195
Gallic acid in, II. 198
Gelatine in, II. 199
Hamamelis in, II. 198
Injection of astringent solutions in, II. 198
Local applications in, II. 198
Oil of santol in, II. 198
Rest in, II. 197
Seat of hæmorrhage in, II. 196
Supra-renal extract in, II. 199
Treatment, II. 197
See also Additional Formulæ, II. 207, 208
Hæmoglobinuria, II. 199—201
Causation of, II. 200
Characters of the urine in, II. 199
Different forms of, II. 200
Drugs in, II. 201
Paroxysmal form of, II. 200
Protection from chill in, II. 200
Quinine in, II. 201
Toxic form of, II. 201
Hæmophilia, I. 125
Hæmoptysis in mitral stenosis, I. 361—2
in phthisis. *See* Phthisis, Symptomatic treatment of, II. 56—83
Hæmorrhage.
Cerebral. *See* Apoplexy, II. 263—75
in anæmia, I. 455, 472
in cancer of the stomach, I. 87
in ulcer of the stomach, I. 67, 71, 80—82
Hæmorrhoids in constipation, I. 203
in liver disease, II. 159
Hamamelis in hæmaturia, II. 198
Hay fever (HAY ASTHMA), I. 589—94
Adrenalin in, I. 594
Antiseptic lotions in, I. 592
Atropine in, I. 593
Avoidance or suppression of the local irritant in, I. 591
Cause of, I. 589—90
Cauterisation in, I. 594
Chloretone in, I. 594
Climate in, I. 591
Hay fever (*continued*)
Cocaine in, I. 592
Constitutional treatment in, I. 594
Etiology of, I. 590
Forms of, I. 589
Hydrozone in, I. 592
Indications for treatment, I. 590
Inhalations in, I. 593
Morphine in, I. 593
Protargol in, I. 592
Relief of the local sensitiveness and congestion in, I. 591—4
Resorcin in, I. 592
Supra-renal substance in, I. 593
Surgical measures in, I. 594
Hazeline in hæmaturia, II. 198
Headaches, II. 354—69
ANÆMIC, II. 363, 364—65
Aperients in, II. 364
Insomnia in, II. 365
Neurotic cases, II. 365
Nitro-glycerine in, II. 365
Tonics in, II. 364
CONGESTIVE, II. 363, 366—67
Bromides in, II. 367
Dietetic and regiminal measures in, II. 367
Seton in refractory cases of, II. 367
MIGRAINE, II. 355—62
Aconitine in, II. 362
Antipyrin in, II. 361
Aperients in, II. 358, 359
Arsenic in, II. 359, 360
Bromides in, II. 359, 360, 361
Cannabis indica in, II. 360
Caffeine in, II. 361
Diet in, II. 358, 359
Ergot in, II. 360, 362
Guarana in, II. 361
Hyoscyamin injection in, II. 362
Iron in, II. 359, 360
Migranin in, II. 361
Mineral waters in, II. 358, 359
Oil of eucalyptus in, II. 362
Paroxysmal, II. 355
Phenacetin in, II. 361
Pyranidin in, II. 361
Quinine in, II. 359
Rest cure in, II. 359, 362
Seton in, II. 362
Sodium salicylate in, II. 359, 361
Symptoms, II. 355, 356
Treatment of, II. 358—62
Vascular spasm in, II. 357
Vasomotor disturbance in, II. 357
Visual disturbance in, II. 355—56
NEURASTHENIC, II. 363, 365—66
Dietetic and regiminal treatment of, II. 366
Drug treatment in, II. 366

Headaches: NEURASTHENIC (*continued*)
Hydrotherapy in, II. 365
Massage in, II. 365
SYMPATHETIC or REFLEX, II. 363, 368—69
Operations in, II. 368—69
"Specialist" treatment in, II. 368
TOXÆMIC, II. 363, 367—68
Cholagogue aperients in, II. 368
Potassium iodide in, II. 368
Wide application of the term, II. 367
See also Additional Formulæ, II. 380—82
Heart and Blood-vessels, Diseases of the. *See* Aneurism, I. 440—51; Angina pectoris, I. 419—34; Aortic insufficiency, I. 372—78; Aortic stenosis, I. 370—71; Arterio-sclerosis, 436—40; Cardiac degeneration, I. 389—99; Cardiac dilatation, I. 342—43, 383—89; Cardiac hypertrophy, I. 342—43, 380—83; Cardiac pain, I. 410—19; Cardiac valvular lesions, I. 340—57; Endocarditis, acute, I. 331—37; Endocarditis, malignant, I. 337—39; Palpitation, I. 402—10; Pericarditis, acute, I. 325—31
Heartburn in chronic gastric catarrh, I. 50
in dyspepsia, I. 165
in gastro-ectasis, I. 104
in ulcer of the stomach, I. 68
Hemiplegia in apoplexy, II. 271, 272
Hepatitis, Acute suppurative (ABSCESS OF LIVER), II. 149—55
Amœbæ coli in, II. 150, 152, 153
Etiology, II. 149
Free incision and drainage in, II. 153, 154
Ipecacuanha in, II. 153
Local applications in, II. 153
Morphine in, II. 153
Multiple abscesses, II. 149
Preliminary puncture and aspiration in, II. 153
Pyrexia in, II. 151
"Solitary" abscess, II. 150
Symptoms, II. 151
Treatment, II. 152
Hepatitis, Chronic interstitial (CIRRHOSIS OF LIVER), II. 155—69
Alcohol as cause, II. 157
Alkalies in, II. 162, 164
Ammonium chloride in, II. 167
Aperients in, II. 163
Ascites in, II. 159, 164
Hepatitis, Chronic interstitial (*continued*)
Diet in, II. 160, 161
Diuretics and purgatives in, II. 166, 167
Hæmatemesis in, II. 159, 163
Indications for treatment, II. 160
Mineral waters in, II. 161, 162, 168
Nature and causes of, II. 156
Nitro-hydrochloric acid in, II. 163
Paracentesis abdominis in, II. 165
Podophyllin in, II. 161
Potassium iodide in, II. 167
Stimulants in, II. 161
Tapping for ascites in, II. 164, 165
Tonics in, II. 167
Toxic symptoms, II. 159, 168
Varieties of, II. 157, 158
See also Additional Formulæ, II. 169, 170
Heroin in influenza, II. 708—9
in phthisis, II. 68, 70, 74
Herpes of the mouth. *See* Stomatitis, Vesicular, I. 3—5
Herpes zoster (SHINGLES), II. 342—3
Himrod's "cure for asthma," I. 573
Hodgkin's disease. Pseudoleukæmia, or **Lymphadenoma,** I. 482—85
Arsenic in, I. 484
Causation, I. 482
Iron in, I. 485
Massage in, I. 484
Phosphorus in, I. 484
Quinine in, I. 485
Symptoms, I. 483
Tonics in, I. 484—85
Treatment, I. 483—84
Hydatid cysts, II. 171—78
Abdominal section, incision, and evacuation for, II. 178
Antiseptic irrigation in, II. 178
Characters of fluid in, II. 173
Corrosive sublimate in, II. 178
Injection of medicinal substances in, II. 178
Internal medication in, II. 175
Origin, nature, and development of, II. 171, 172
Potassium iodide in, II. 175
Prophylaxis, II. 172
Rupture of, II. 174
Simple or electro-puncture in, II. 176
Spontaneous cure of, II. 174, 175
Suppuration of, II. 174
Symptoms, II. 173
Tænia echinococcus in causation of, II. 171
Tapping for, II. 176—78
Treatment of, II. 174—78

Hydrastis in hæmaturia, II. 198
  in simple catarrhal stomatitis, I. 3
Hydrocephalus, Acute. *See* Meningitis, Tubercular, II. 254—59
Hydronephrosis, II. 216—18
  Causation of, II. 216
  Intermittent, II. 217
  Manipulation, II. 217
  Nephrotomy in, II. 218
  Puncture in, II. 217
  Spontaneous cure of, II. 217
Hydrotherapy—
  in anæmia, I. 461
  in constipation, I. 212
  in dyspepsia, I. 171
  in exophthalmic goitre, I. 490
  in gastro-ectasis, I. 114
  in hysteria, II. 436—37
  in insomnia, II. 372
  in liver disease, II. 147
  in locomotor ataxy, II. 293
  in neuralgia, II. 323, 343
  in paraplegia, II. 312
  in phthisis, I. 695
  in rheumatism, II. 464
  in typhoid fever, II. 683—87
Hyoscine in asthma, I. 577
  in chorea, II. 398
Hyperæmic conditions of the liver. *See* Liver, Hyperæmia of, II. 142—48
Hypertrophic cirrhosis, II. 160
Hypertrophy of tonsils. *See* Tonsils, Chronic enlargement of, I. 18—19
Hypnotics in insomnia, List of, with brief comments, II. 373—80
Hypnotism in hysteria, II. 438
  in insomnia, II. 377
Hysteria, II. 426—44
  Causation of, II. 429—31
  Contractures in, II. 428—29, 440
    Atropine in, II. 441
    Chloroform in, II. 440
  Convulsive attacks of, II. 427, 439—40
    Cold water in, II. 439
    Compression of ovary in, II. 439
    Electricity in, II. 440
    Inhalations in, II. 440
  Forms of, II. 427—28
  Hysterical state of, II. 431—38
    Antispasmodics in, II. 434
    Bromides in, II. 435
    Chloral in, II. 435—36
    Diet in, II. 432
    Electricity and massage in, II. 438
    Hydrotherapy in, II. 436 - 37
    Hygienic management of, II. 432
    Hypnotism and suggestion in, II. 438
Hysteria (*continued*)
    Methylene blue in, II. 434
    Morphine in, II. 435—36
    Sea-bathing in, II. 437—38
  Paralysis in, II. 428, 441—44
    Aphonia in, II. 442—3
    Electricity in, II. 441, 442, 443
    Forced feeding in, II. 443
    Psychotherapy in, II. 442, 443
    Valerianate of zinc in, II. 443
    See also Additional Formulæ, II. 454—55

ICHTHYOL OINTMENT in rheumatism, II. 462, 564
  in small-pox, II. 623
Infective Diseases, Specific. *See* Cholera, II. 739—57; Diphtheria, II. 578—99; Influenza, II. 699—712; Intermittent malarial fever, II. 718—28; Measles, II. 639—44; Malarial cachexia, II. 720, 730; Pernicious malarial fever, II. 719, 728—29; Remittent malarial fever, II. 719, 728; Rötheln, II. 644—45; Scarlet fever, II. 627—39; Small-pox, II. 613—27; Tetanus, II. 730—37; Typhoid fever, II. 657—93; Typhus fever, II. 693—98; Whooping-cough, II. 599—612
Influenza, II. 699—712
  After-effects of, II. 699, 700
  Alkaline drinks in, II. 709
  Ammonia chloride in, II. 709
  Antipyrin in, II. 701, 708, 712
  Antiseptics in, II. 707
  Aperients in, II. 706
  Arsenic in, II. 711
  Bismuth in, II. 710
  Bronchitis and pneumonia of, II. 709
  Camphor in, II. 711
  Cardiac asthenia of, II. 711
  Causation of, II. 707
  Cerebro-spinal form, II. 710
  Chloroform in, II. 709, 710
  Dangers of analgesic and antithermic drugs in, II. 700, 701
  Dover's powder in, II. 701, 707
  Epidemics of, II. 699
  Fatal complications in the feeble and aged, II. 709, 710, 712
  Gastro-intestinal catarrh of, II. 710
  Gastro-intestinal pains of, II. 708
  Headache of, II. 708
  Heroin in, II. 708
  High temperature in, II. 708
  Hydrocyanic acid in, II. 710
  Infective agent of, II. 707
  Inhalations in, II. 709, 711

Influenza (*continued*)
- Laryngo-tracheal cough of, II. 708
- Milk in, II. 709, 712
- Morphine in, II. 708, 710
- Phenacetin in, II. 708, 712
- Preventives against infection from, II. 711
- Quinine in, II. 702–6, 711, 712
- Salicin in, II. 700, 701, 707, 708
- Strychnine in, II. 710, 711
- Symptoms and complications of, II. 700, 707
  - *See also* Additional Formulæ, II. 737, 738

Ingluvin in vomiting, I. 140

Insomnia, II. 369—80
- Alcohol in, II. 373—74
- Amylene hydrate in, II. 378
- Apomorphine in, II. 378
- Bromides in, II. 374, 377, 378
- Butyl-chloral hydrus in, II. 379
- Camphor monobromide in, II. 379
- Cannabis indica in, II. 379
- Causes of, II. 369—72
- Chloral in, II, 374, 378
- Chloralamide in, II. 375
- Chloralose in, II. 376
- Chloretone in, II. 379
- Chlorobrom in, II. 379
- Chloroform and ether in, II. 377
- Climate in, II. 377
- Digitalis in, II. 377
- Dormiol in, II. 379
- Electricity in, II. 373
- Enema in, II. 371
- Hedonal in, II. 379
- Hydrotherapy in, II. 372
- Hyoscyamus in, II. 377
- Hypnal in, II. 380
- Hypnotism in, II. 377
- Lupulin in, II. 380
- Massage in, II. 372
- Metaldehyde in, II. 380
- Methylal in, II. 380
- Opium in, II. 374
- Paraldehyde in, II. 376
- Pellotine in, II. 380
- Piscidia in, II. 380
- Sodium bicarbonate in, II. 371
- Strychnine in, II. 377
- Sulphonal in, II. 375—76
- Tetronal and trional in, II. 376
- Uralium (or ural) in, II. 380
- Urethane in, II. 380
  - *See also* Additional Formulæ, II. 382—83

Intermittent fever. *See* Malarial Fevers, II. 713—30

Intestinal obstruction, I. 268—283
- Acute, I. 276—280
- Belladonna in, I. 276, 280
- Cases of compression or traction, I. 273

Intestinal obstruction (*continued*)
- Cases of impaction of fæces, I. 274
- Cases of intussusception, I. 277
- Cases of stricture, I. 275
- Causes of, I. 269—270
- Chronic, I. 282
- Colotomy in, I. 282
- Diagnostic measures in, I. 271
- Diet in, I. 283
- Enemata in, I. 273, 278, 283
- Enterotomy in, I. 280
- Gall-stone, I. 272, 277, 282
- Laparotomy in, I. 282
- Massage in, I. 277
- Opium in, I. 275, 276, 277, 279, 280
- Paralytic distension, I. 270, 282
- Peritonitis in causation of, I. 273
- Positional lesions, I. 270
- Saline purgatives in, I. 282
- Taxis in, I. 277
  - For other intestinal diseases *see* Digestion, Diseases of organs of, I. 1—323

Intubation for diphtheria, II. 592

Intussusception, I. 277—281
- Antiseptics in, I. 279
- Baths in, I. 278
- Digital examination in, I. 277
- Enterotomy in, I. 280, 281
- Injections in, I. 278
- Nutrient enemata in, I. 279
- Opium in, I. 277, 279
- Puncture in, I. 278
- Surgical measures in, I. 280, 281

Iodine in arthritis deformans, II. 476, 477
- in chronic nasal catarrh, I. 511
- in hydatid cysts, II. 178
- in mercurial stomatitis, I. 12
- in ozæna, I. 511, 512
- in peritonitis, I. 318, 321, 322
- in phthisis, II. 30—33, 86
- in scarlet fever, II. 637
- in typhoid fever, II. 674

Iodoform in cerebral tumour, II. 279
- in chronic nasal catarrh, I. 512
- in gangrenous stomatitis, I. 10
- in meningitis, II. 257
- in peritonitis, I. 318—22
- in phthisis, II. 31—32, 36, 86
- in small-pox, II. 621
- in ulcerative stomatitis, I. 9
- in vesicular stomatitis, I. 5

Ipecacuanha in acute bronchitis, I. 534, 535
- in acute gastric catarrh, I. 45, 48
- in acute laryngeal catarrh, I. 513, 517
- in asthma, I. 574
- in chronic bronchial catarrh, I. 543, 550
- in chronic gastric catarrh, I. 53
- in dysentery, I. 259—61, 265

- Ipecacuanha in hæmoptysis, II. 77
  - in hepatitis, II. 153
  - in jaundice, II. 133
  - in laryngeal diphtheria, II. 592
  - in liver disease, II. 158
  - in malarial cachexia, II. 730
- Iron in anæmias, I. 463—70, 474
  - in arthritis deformans, II. 477, 478
  - in Bright's disease, II. 236, 249
  - in chronic heart disease, I. 371
  - in diphtheria, II. 589
  - in dysentery, I. 265
  - in emphysema, I. 297
  - in exophthalmic goitre, I. 492
  - in gastric ulcer, I. 78
  - in headaches, II. 359, 360
  - in neuralgia, II. 322, 336
  - in phthisis, II. 48, 49
  - in rheumatism, II. 466
  - in scarlet fever, II. 638
  - in urinary affections, II. 192, 198, 201, 205

- JABORANDI in hæmaturia, II. 198
- Jambul in diabetes, II. 532—33
- **Jaundice**, II. 126—40
  - Alkaline drinks in, II. 131, 134
  - Aperients in, II. 132, 136, 137, 140
  - Baths in, II. 137
  - Calomel in, II. 132
  - Catarrhal, II. 128
  - Causation, II. 126—29
  - Cholæmia in, II. 130
  - Chronic, II. 134
  - Creasote in, II. 136
  - Cutaneous irritation in, II. 137
  - Diet in, II. 131, 135
  - Diuretics in, II. 138
  - Electricity in, II. 134
  - Emetics in, II. 133
  - Enemata in, II. 133
  - Hæmatogenous, II. 127
  - Henbane in, II. 132
  - Hepatogenous, II. 127
  - Indications for treatment, II. 131
  - Injection of cold water in, II. 132
  - Iridin in, II. 132
  - Local applications in, II. 131
  - Mineral waters in, II. 131, 132, 138
  - Nitrate of silver in, II. 133
  - Nitro-hydrochloric acid in, II. 134
  - Non-obstructive, II. 139
  - Obstructive, II. 130
  - of new-born children, II. 139
  - Ox-gall in, II. 136
  - Pilocarpine in, II. 137
  - Sodium bicarbonate in, II. 131, 133, 140
  - Symptoms, II. 130
  - Tonics in, II. 138
  - Toxhæmia, II. 139
  - Turpentine in, II. 136
    - *See also* Additional Formulæ, II. 140, 141
- Jejunostomy for cancer of the stomach, I. 99
- Juniper in urinary affections, II. 195

- KAMALA in hydatid cysts, II. 175
  - in intestinal parasites, I. 294, 298
- Klebs - Löffler bacillus of diphtheria, II. 578
- Koch's bacillus of cholera, II. 789, 748
- Koumiss in tuberculosis, I. 686
- Kousso and koussin as vermicides I. 292

- LACTATE OF IRON in gastralgia, I 145, 146
- Lactic acid in diarrhœa, I. 235
  - in phthisis, II. 87
- Laminectomy for paraplegia, II. 314
- Laparatomy for intestinal obstruction, I. 282
  - for peritonitis, I. 317, 319—21, 323
- "Lapis divinus," Composition of, I. 5
- **Laryngeal catarrh, Acute**, I. 512 – 18
  - Alkaline drinks in, I. 513
  - Alkaline sprays in, I. 514
  - Codeia or morphine in, I. 513
  - Cough in, I. 513, 515, 517
  - Emetics in, I. 517
  - in children, I. 515—18
  - Inhalations in, I. 515
  - Ipecacuanha in, I. 513, 517
  - Leeches in, I. 516
  - Saline aperients in, I. 514
  - Scarification in, I. 517
  - Sedatives in, I. 513
  - Tincture of benzoin in, I. 515
  - Tracheotomy in, I. 517
  - Treatment, I. 513
    - *See also* Additional Formulæ, I. 521, 522
- **Laryngeal catarrh, Chronic**, I. 518—21
  - Astringents in, I. 519, 520
  - Causes and symptoms, I. 518
  - Inhalations in, I. 519
  - Insufflations in, I. 519
  - Local applications in, I. 519
  - Massage in, I. 520
  - Mineral waters in, I. 520
  - Night cough in, I. 519
  - Sprays in, I. 519, 520
    - *See also* Additional Formulæ, I. 521, 522
- **Laryngeal phthisis**. *See* Phthisis, Laryngeal, II. 85—89
- **Lead colic** I. 185, 186, 193 – 98
  - Alum mixture for, I. 198
  - Aperient sulphates in, I. 195—6
  - Atropine in, I. 195
  - Belladonna in, 195—96
  - Carbonate of lime in, I. 194

Lead colic (*continued*)
- Castor oil in, I. 195, 196
- Causes of, I. 193
- Enema in, I. 196
- Medicinal treatment of, I. 195—98
- Morphine in, I. 195
- Opiates in, 195, 196
- Pain in, I. 193
- Potassium iodide in, I. 196—97
- Prophylactic treatment in, I. 194
- Rectal injection of ether vapour in, I. 196
- Sulphuric acid in, I. 195
- Symptoms of, I. 193—94
- Vomiting in, I. 194

Leiter's tubes in meningitis, II. 260
- in palpitation, I. 410
- in peritonitis, I. 309

Leukæmia, or **Leucocythæmia**, I. 478—82
- Characters, I. 478
- Douches in, I. 481
- Electricity in, I. 481
- Excision for, I. 481
- Injections in, I. 481
- Oxygen inhalations, I. 481
- Phosphorus in, I. 481
- Quinine in, I. 480
- Sodium cacodylate in, I. 481
- Symptoms, I. 479
- Tonics in, I. 480
- Treatment, I. 480

Lithiasis, II. 180—90
- Alkalies in, II. 186
- Amorphous urates in, II. 181
- Aperients in, II. 189
- Bicarbonates in, II. 186
- Causation, II. 182
- Deposit of uric acid in, II. 185
- Etiology, II. 182
- Exercise and baths in, II. 189
- Food in, II. 184, 185, 187
- Mineral springs in, II. 188
- Potassium citrate in, II. 186
- Treatment, II. 183
- Water-drinking in, II. 188
  - *See also* Additional Formulæ, II. 207

Lithium in neuralgia, II. 322

Lithium salts in gout, II. 496

Liver, Congestion of. *See* Liver, Hyperæmia of, II. 142—48

Liver, Diseases of the. *See* Gall-stones, II. 108—24; Hepatitis, II. 149—69; Hydatid cysts, II. 171—78; Jaundice, II. 126—40; Hyperæmia of, II. 142—48

Liver, Glycogen- and sugar-forming functions of the, II. 514—15

Liver, Hyperæmia of, II. 142—48
- Active or fluxionary, II. 143
- Alkaline effervescents in, II. 146

Liver, Hyperæmia of (*continued*
- Aperients in, II. 146
- Causes of, II. 143, 144
- Chronic, II. 147
- Counter-irritation in, II. 145
- Diet and regimen in, II. 145
- Hydrotherapy in, II. 145
- Indications for treatment, II. 145
- Mineral waters in, II. 145—47
- Passive, II. 143, 147
- Symptoms, II. 144
  - *See also* Additional Formulæ, II. 169

Liver-chill, II. 143

Lobelia in asthma, I. 176
- in bronchial catarrh, I. 537

Locomotor ataxy. *See* Ataxy, Progressive locomotor, II. 284—96

Lumbago. *See* Rheumatism, Chronic muscular, II. 467—71

Lung, Gangrene of the, I. 641

Lymphadenoma. *See* Hodgkin's disease, I. 482—85

Lymphatic leukæmia. *See* Leukæmia, I. 478—82

MAGNESIUM SULPHATE in constipation, I. 215, 360

Malarial cirrhosis, II. 168

Malarial fevers, II. 713—30
- INFECTION IN, II. 713—17
  - Conveyed by *Plasmodium malariæ*, II. 714—15
  - Mosquitoes as disseminating agents in, II. 714—15
  - Prophylactic measures, II. 715—17
  - Sulphuric dioxide as a disinfectant, II. 717
  - Supposed telluric nature of, II. 713
- INTERMITTENT FORM OF (*Ague*), II. 718—19, 720—28
  - After treatment of, II. 727—28
  - Antipyrin in, II. 726
  - Arsenic in, II. 725
  - Cinchonidine in, II. 725
  - Methylene blue in, II. 725
  - Morphine in, II. 726
  - Periodicity of paroxysms in, II. 718
  - Phenocoll in, II. 725
  - Purgatives in, II. 727
  - Quinine in, II. 715, 720—25, 727
  - Stages of, II. 718
- MALARIAL CACHEXIA, II. 720, 730
  - Character of, II. 720
  - Climate in, II. 730
  - Drugs in, II. 730
  - Hydrotherapy and massage in, II. 730
  - Prophylaxis in, II. 730

Malarial fevers (*continued*)
PERNICIOUS FORM OF, II. 719, 728—29
Cardiac stimulants in, II. 729
Fatality of, II. 719
Forms of, II. 719
Hæmorrhagic form of, II. 719, 729
Morphine (with atropine) in, II. 729
Quinine in, II. 728
Vomiting in, II. 729
Strychnine in, II. 729
REMITTENT FORM OF, II. 719, 728
Aperients in, II. 728
Bromide in, II. 728
Enemata in, II. 728
Morphine in, II. 728
Quinine in, II. 728
Resemblance to typhoid fever, II. 719
Varying nature of, II. 719
Manganese in anæmia, I. 469
Massage in anæmia, I. 461, 478
in apoplexy, II. 272
in atonic dyspepsia, I. 171, 180
in chorea, II. 391
in chronic laryngeal catarrh, I. 520
in constipation, I. 205, 206
in diabetes, II. 521
in dilatation of stomach, I. 113
in diphtheria, II. 596
in dropsical effusions, I. 368
in dysentery, I. 263
in dyspepsia, I. 171, 180
in enteralgia, I 192
in gall-stones, II. 117
in gastric catarrh, I. 45
in hysteria, II. 438
in infantile paralysis, II. 301
in insomnia, II. 372
in intestinal obstruction, I. 277
in locomotor ataxy, II. 295
in malarial fevers, II. 730
in neuralgia, II. 323—24, 340, 341
in neurasthenia, II. 448, 449
in neuritis, II. 351
in paralysis, II. 398
in rheumatism, II. 462
in sciatica, II. 340, 341
Measles, II. 639—44
Aperients in, II. 642
Broncho-pneumonia in, II. 641
Characters of, II. 639
Chloral enemata in, II. 644
Complications and sequelæ of, II. 641
Constipation in, II. 644
Diaphoretics in, II. 642
Dry-cupping in, II. 644
Insufflation of astringents for epistaxis in, II. 644
Symptoms, II. 640
Tonics in, II. 642
Measles (*continued*)
Treatment, II. 640, 641
Turpentine liniment in, II. 643
Varieties, II. 640
Meningitis, Chronic spinal, II. 306
Meningitis, Epidemic cerebro-spinal. *See* Cerebro-spinal fever, II. 757—762
Meningitis, Simple, II. 259—62
Antipyretics in, II. 261, 262
Antiseptics in, II. 262
Causes, II. 259
Chloral in, II. 261
Cold applications in, II. 260, 262
Diet in, II. 262
Indications for treatment, II. 260
Lumbar puncture in, II. 261
Mercurial inunction in, II. 261
Morphine in, II. 261
Potassium iodide in, II. 261
Quinine (with phenacetin) in, II. 262
Rectal feeding in, II. 262
Sedatives in, II. 260
Symptoms, II. 260
See also Additional Formulæ, II. 282
Meningitis, Tubercular, II. 254—59
Early treatment essential, II. 256
Enema in, II. 258
Iodoform ointment in, II. 257
Mercurial inunction in, II. 257, 258
Nature and seat of, II. 254
Operation for, II. 258
Potassium iodide in, II. 256
Prophylaxis, II. 256
Rectal feeding in, II. 258
Symptoms in adults, II. 255
Symptoms in children, II. 254
Treatment of, II. 255
Tubercle bacilli in, II. 254
See also Additional Formulæ, II. 282
Menthol in acute nasal catarrh, I. 508, 509
in acute tonsillitis, I. 17
in bronchial catarrh, I. 549
in enteralgia, I. 191, 192
in neuralgia, II. 330
in phthisis, II. 38, 87
in small-pox, II. 625
in vomiting, I. 135, 139
Mercurial inunction in cerebral tumour, II. 278, 279
in locomotor ataxy, II. 287, 288
in meningitis, II. 257, 258, 261
in neuralgia, II. 322
Mercurial salivation. *See* Stomatitis, mercurial, I. 11—13
Mercurial stomatitis. *See* **Stomatitis, mercurial**, I. 11—13

Migraine. *See* Headaches, II. 854—69
Mesarteritis, I. 436
Mineral waters.
Aix (Savoy) in chronic bronchial catarrh, I. 559
Aix-la-Chapelle in gout, II. 497, 501
in neuralgia, II. 322
in paraplegia, II. 312
in pharyngeal catarrh, I. 27
in phthisis, II. 51
in rheumatism, II. 463
Aix-les-Bains in neuralgia, II. 322, 341
in rheumatism, II. 463
Allevard in phthisis, II. 53
Amélie in phthisis, II. 52
Apenta in albuminuria, II. 206
in Bright's disease, II. 247
in constipation, I. 212
in diabetes, II. 535
in gall-stones, II. 121
in nasal catarrh, I. 505
in perityphlitis, I. 253
Apollinaris in acute laryngeal catarrh, I. 513
in acute tonsillitis, I. 18
in Bright's disease, II. 247
in bronchial catarrh, I. 526, 537, 542, 543
in cholera, II. 257
in constipation, I. 204, 212
in diabetes, II. 528
in diarrhœa, I. 223
in dilatation of stomach, I. 108
in epilepsy, II. 411
in gall-stones, II. 121
in gastric catarrh, I. 60, 61
in gastro-ectasis, I. 108
in gout, II. 495, 498, 505, 509
in headaches, II. 858
in heart disease, I. 363
in hepatitis, II. 161, 168
in hyperæmia of liver, II. 146
in influenza, II. 709
in jaundice, II. 132, 133
in measles, II. 644
in phthisis, II. 65
in typhoid fever, II. 670
in urinary affections, II. 188, 192
in vomiting, I. 134
Baden (Switzerland) in rheumatism, II. 463
Baden-Baden in arterio-sclerosis, I. 440
in neuralgia, II. 341
in rheumatism, II. 463
Balaruc in locomotor ataxy, II. 295
Barèges in chronic bronchial catarrh, I. 559
Bath in gout, II. 497, 501
in neuralgia, II. 321, 341
in rheumatism, II. 463

Mineral waters (*continued*)
Birmenstorf in constipation, I. 212
Bormio in rheumatism, II. 463
Bourbonne in neuralgia, II. 321
in rheumatism, II. 463
Bourboule in acute laryngeal catarrh, I. 513
in acute tonsillitis, I. 18
in asthma, I. 578
in bronchial catarrh, I. 525, 532, 543, 559
in chronic laryngeal catarrh, I. 520
in diabetes, II. 527
in pharyngeal catarrh, I. 26
in phthisis, II. 51, 53, 54, 65
in pneumonia, I. 623, 640
in whooping-cough, II. 606
Brides-les-Bains in arterio-sclerosis, I. 439
in constipation, I. 212
in dysentery, I. 266
in dyspepsia, I. 168, 169
in gall-stones, II. 120
in heart disease, I. 395
in liver disease, II. 147, 162
in malarial fevers, II. 730
Buxton in gout, II. 497, 501
in neuralgia, II. 321, 341
in neurasthenia, II. 452
in rheumatism, II. 463
Carlsbad in cholera, II. 757
in constipation, I. 211, 212
in chronic bronchial catarrh, I. 544, 559
in chronic pharyngeal catarrh, I. 24
in diabetes, II. 527, 528, 529, 535
in dilatation of stomach, I. 112, 113
in dysentery, I. 266
in dyspepsia, I. 168
in gall-stones, II. 120, 121
in gastralgia, I. 147
in gastric catarrh, I. 46, 53, 60
in gastro-ectasis, I. 112, 113
in gout, II. 497, 499
in headache, II. 858, 867
in heart disease, I. 382, 395, 427
in jaundice, II. 132, 134
in liver disease, II. 147, 162, 168
in malarial fevers, II. 727, 730
in ulcer of stomach, I. 74, 75
in urinary affections, II. 189, 192, 206
Cauterets in chronic bronchial catarrh, I. 559
in chronic laryngeal catarrh, I. 520
in pharyngeal catarrh, I. 27
in phthisis, II. 27
Challes in chronic bronchial catarrh, I. 559
Contrexéville in diabetes, II. 528

Mineral waters (*continued*)
  Contrexéville in gout, II. 497, 500
    in urinary affections, II. 188, 189, 192, 214, 219
  Dax in rheumatism, II. 463
  Droitwich in neuralgia, II. 321, 341
    in rheumatism, II. 463
  Eaux Bonnes in chronic bronchial catarrh, I. 559
    in chronic laryngeal catarrh, I. 520
    in pharyngeal catarrh, I. 27
    in phthisis, II. 51, 52
  Elster in gastric ulcer, I. 83
  Ems in bronchial catarrh, I. 542, 543, 559
    in diabetes, II. 528
    in gastric catarrh, I. 45, 54, 61
    in gout, II. 498
    in jaundice, II. 138
    in laryngeal catarrh, 513, 520
    in liver disease, II. 162
    in nasal catarrh, I. 509
    in pharyngeal catarrh, I. 25
    in phthisis, II. 51, 52, 65
    in pneumonia, I. 623
    in urinary affections, II. 188, 214
    in whooping-cough. II. 606
  Evian in urinary affections, II. 188, 214
  Franzensbad in gastric ulcer, I. 83
  Friedrichshall in constipation, I. 212
  Gastein in gout, II. 497, 501
    in locomotor ataxy, II. 294
    in neuralgia, II. 321, 341
    in neurasthenia, II. 453
    in paraplegia, II. 312
    in rheumatism, II. 463
  Gleichenberg in phthisis, II. 51, 52
  Harrogate in constipation, I. 212
    in dyspepsia, I. 169
    in gout, II. 497, 501
    in heart disease, I. 395
    in liver disease, II. 147
    in neuralgia, II. 322, 341
    in rheumatism, II. 463
  Homburg in constipation, I. 212
    in dyspepsia, I. 169
    in gout, II. 497, 499, 500
    in headaches, II. 358
    in heart disease, I. 382, 427
    in malarial fevers, II. 730
    in rheumatism, II. 463
  Ischl in neuralgia, II. 321
  Kissingen in arterio-sclerosis, I. 439, 440
    in chronic bronchial catarrh, I. 559
    in constipation, I. 212
    in diarrhœa, I. 238
    in dysentery, I. 266
    in dyspepsia, I. 168, 169
    in gall-stones, II. 120

Mineral waters (*continued*)
  Kissingen in gastric catarrh, I. 54
    in gout, II. 499, 500
    in headaches, II. 367
    in heart disease, I. 395
    in liver disease, II. 147, 162
    in malarial fevers, II. 730
  Kreuznach in phthisis, II. 51
  Lamalou in locomotor ataxy, II. 295
  Leamington in constipation, I. 212
    in dyspepsia, I. 169
    in gout, II. 499
    in liver disease, II. 147
  Lippspringe in phthisis, II. 51
  Llandrindod in constipation, I. 212
  Marienbad in arterio-sclerosis, I. 439
    in chronic bronchial catarrh, I. 559
    in constipation, I. 212
    in dyspepsia, I. 168, 169
    in gall-stones, II. 120
    in gastric catarrh, I. 53
    in headaches, II. 358, 367
    in heart disease, I. 395
    in jaundice, II. 134
    in liver disease, II. 147, 162, 168
    in malarial fevers, II. 730
    in rheumatism, II. 463
  Mont Dore in asthma, I. 581
    in chronic bronchial catarrh, I. 559
    in laryngeal catarrh, I. 520
    in phthisis, II. 51, 53, 54
  Nauheim in gout, II. 499
    in heart disease, I. 395
    in locomotor ataxy, II. 295
    in paraplegia, II. 312, 315
    in rheumatism, II. 463
  Néris in locomotor ataxy, II. 295
    in rheumatism, II. 463
  Neuenahr in arterio-sclerosis, I. 440
    in chronic bronchial catarrh, I. 559
    in diabetes, II. 527, 528
    in dyspepsia, I. 169
    in gout, II. 498
    in liver disease, II. 162
    in phthisis, II. 51
    in urinary affections, II. 188
  Plombières in chronic bronchial catarrh, I. 559
    in rheumatism, II. 463
  Püllna in constipation, I. 212
  Pyrmont in anæmias, I. 469
    in gastralgia, I. 146
    in headaches II. 359
    in malarial fevers, II. 78
  Ragatz in locomotor ataxy, II. 294
    in neuralgia, II. 321, 341
    in paraplegia, II. 312
    in rheumatism, II. 463

Mineral waters (*continued*)
  Rehme in locomotor ataxy, II. 295
    in paraplegia, II. 312, 315
  Reichenhall in chronic bronchial catarrh, I. 559
    in phthisis, II. 51
  Royat in arterio-sclerosis, I. 440
    in gout, II. 497
    in phthisis, II. 51, 53
    in urinary affections, II. 188
  Rubinat in constipation, I. 212
  Salzbrunn in phthisis, II. 51, 52
  Salzungen in phthisis, II. 51
  Schlangenbad in neurasthenia, II. 453
    in paraplegia, II. 312
    in rheumatism, II. 463
  Schwalbach in anæmias, I. 468, 469
    in gastralgia, I. 146
    in headaches, II. 359
    in neuralgia, II. 323, 343
  Selters in bronchial catarrh, I. 526
  Seltzer in bronchial catarrh, I. 543
    in headaches, II. 358
  Soden in chronic bronchial catarrh, I. 559
    in phthisis, II. 51
  Spa in anæmias, I. 468, 469
    in gastralgia, I. 146
    in headaches, II. 359
    in neuralgia, II. 343
  St. Amand in rheumatism, II. 463
  St. Honoré in chronic bronchial catarrh, I. 559
    in phthisis, II. 51, 52
  St. Moritz in anæmias, I. 468, 469
    in gastralgia, I. 146
    in gout, II. 497
    in neuralgia, II. 323
  St. Sauveur in chronic bronchial catarrh, I. 559
  Strathpeffer in gout, II. 501
    in neuralgia, II. 322
    in rheumatism, II. 463
  Tarasp in arterio-sclerosis, I. 439
    in constipation, I. 212
    in dysentery, I. 266
    in dyspepsia, I. 168, 169
    in gastric catarrh, I. 53
    in headaches, II. 359
    in liver disease, II. 147, 162
    in malarial fevers, II. 730
  Teplitz in neuralgia, II. 341
  Tunbridge Wells in anæmias, I. 469
  Uriage in chronic bronchial catarrh, I. 559
    in phthisis, II. 51, 53
  Vals in Bright's disease, II. 247
    in diabetes, II. 528
    in dilatation of stomach, I. 108
    in epilepsy, II. 411
    in gall-stones, II. 120

Mineral waters (*continued*)
  Vals in gastric catarrh, I. 54, 61
    in gastro-ectasis, I. 108
    in gout, II. 498
    in jaundice, II. 132
    in liver disease, II. 161
    in urinary affections, II. 188
  Vichy in arterio-sclerosis, I. 440
    in Bright's disease, II. 247
    in chronic pharyngeal catarrh, I. 25
    in diabetes, II. 527, 528
    in diarrhœa, I. 222, 237
    in dilatation of stomach, I. 108
    in dysentery, I. 265
    in dyspepsia, I. 169
    in epilepsy, II. 411
    in gall-stones, II. 120, 121
    in gastralgia, I. 147
    in gastric catarrh, I. 45, 46, 54, 60
    in gastric ulcer, I. 78
    in gastro-ectasis, I. 108, 111
    in gout, II. 497, 498
    in jaundice, II. 132, 134, 138
    in liver disease, II. 147, 161, 162, 168
    in malarial fevers, II. 780
    in pneumonia, I. 623
    in typhoid fever, II. 670
    in urinary affections, II. 187, 188, 192, 206, 214, 219
    in vomiting, I. 134
  Vittel in urinary affections, II. 138, 214
  Weissenberg in chronic bronchial catarrh, I. 559
    in phthisis, II. 51
  Wiesbaden in gout, II. 499, 500
    in neuralgia, II. 341
    in rheumatism, II. 463
  Wildbad in gout, II. 501
    in locomotor ataxy, II. 294
    in neuralgia, II. 341
    in paraplegia, II. 312
    in rheumatism, II. 463
  Woodhall in neuralgia, II. 321
Morphine in acute bronchial catarrh, I. 527, 537
  in acute gastritis, I. 47
  in acute laryngeal catarrh, I. 513
  in acute nasal catarrh, I. 505
  in acute suppurative hepatitis, II. 153
  in aneurism, I. 451
  in angina pectoris, I. 433
  in asthma, I. 568—69, 574
  in cerebro-spinal fever, II. 760
  in chronic valvular disease, I. 36
  in dyspnœa, I. 377—78
  in enteralgia, I. 133
  in gall-stones, II. 113, 114
  in gastralgia, I. 148
  in gastric cancer, I. 93

Morphine in gastric catarrh, I. 47
  in gastric ulcer, I. 79, 81
  in hepatitis II 153
  in influenza, II. 708, 710
  in malarial fevers, II. 726, 728, 720
  in meningitis, II. 261
  in neuralgia, II. 328
  in peritonitis, I. 314
  in phthisis, II. 64, 68, 69
  in pleurisy, I. 670
  in pneumonia, I. 619, 621, 622
  in renal colic, II. 218
  in rheumatism, II. 470
  in small-pox, II. 628
  in tetanus, II. 734, 735
  in vomiting, I. 135, 138
  in whooping-cough, II. 607
Mouth, Catarrh of. *See* Stomatitis, Simple catarrhal, I. 2
Mouth, Diseases of the. *See* Stomatitis, I. 1—12
Musk in delirium of pneumonia, I. 621—22, 638
  in stricture of the œsophagus, I. 31
Myalgia. *See* Rheumatism, Chronic muscular, II. 467—71
Myelitis. *See* Paraplegia, II. 303—15
Myocarditis, Acute, I. 339
Myrtol in bronchial catarrh, I. 550
  in phthisis, II. 39
Myxœdema, I. 495—500
  Characters and nature of I. 495, 496
  Iodothyrine in, I. 499
  Strychnine in, I. 499
  Thyroid extracts in, I. 498
  Thyroid feeding in, I. 498—500
  Thyroid grafting in, I. 497, 498

NAPHTHOL in cholera, II. 752
  in diarrhœa, I. 234
  in typhoid fever, II. 679
Nasal catarrh, Acute. I. 502—9
  Aconite in, I. 507
  Aperients in, I. 505
  Camphor in, I. 507
  Causation in, I. 502, 503
  Cocaine in, I. 509
  General remedies, I. 505—8
  Glycerine in, I. 509
  Inhalation in, I. 508
  Insufflations in, I. 509
  Local measures in, I. 508—9
  Menthol in, I. 508, 509
  Morphine in, I. 505
  Opium in, I. 505, 506
  Prophylaxis, I. 504
  Quinine in, I. 507
  Salicine in, I. 505
  Spray or douche in, I. 509
  Supra-renal gland extract in, I. 509
  Symptoms, I. 503, 504
    See also Additional Formulæ, I. 522
Nasal catarrh, Chronic, I. 509—12
  Acetate of lead in, I. 510
  Cleansing douches in, I. 511
  Galvano-cautery in, I. 512
  Inhalations in, I. 510
  Injections in, I. 510
  Insufflations in, I. 512
  Paints in, I. 511
  Sprays in, I. 510, 512
  Terebene in, I. 510
    See also Additional Formulæ, I. 522, 523
Nauheim (or Schott) treatment of cardiac diseases, I. 396—99, 400—1
Nephritis. *See* Bright's disease, II. 223—51
Nervous Diseases. *See* Apoplexy, II. 263—75 ; Ataxy, Progressive locomotor, II. 284—96 ; Epilepsy, II. 401—24 ; Headaches, II. 354—69 ; Hysteria, II. 426—44 ; Insomnia, II. 369—80 ; Meningitis, II. 254—62 ; Neuralgia, II. 318—44 ; Neurasthenia, II. 444—54 ; Neuritis 344—51 ; Paralysis, II. 296—303, 396—99 ; Paraplegia, II. 303—15
Neuralgia, II. 318—44
  Aconite in, II. 330
  Acupuncture in, II. 328
  Ammonium chloride in, II. 334
  Amyl nitrite in, II. 336
  Anæmia in, II. 319, 322
  Antipyrin in, II. 332, 336
  Aquapuncture in, II. 328
  Arsenic in, II. 322, 336
  Baths in, II. 321, 339
  Belladonna in, II. 330
  Blisters in, II. 325
  Bromides in, II. 324
  Cannabis indica in, II. 330, 336
  Causal indications for treatment, II. 321
  Chloral in, II. 330
  Chloroform in, II. 330, 331
  Cocaine in, II. 333, 336, 339
  Cod-liver oil in, II. 323
  Counter-irritation in, II. 321, 324, 339
  Croton-chloral in, II. 331
  Electricity in, II. 326
  Etiology, II. 319
  Exalgin in, II. 333
  Gelsemium in, II. 331, 336
  Hydrotherapy in, II. 323, 343
  Iron in, II. 322
  Lithium in, II. 322
  Malarial infection in, II. 323
  Massage in, II. 322—24, 340, 341
  Menthol in, II. 330
  Neuropathic cases, II. 323

Neuralgia (*continued*)
Opium in, II. 328
Osmic acid in, II. 333, 339
Phenacetin in, II. 333
Phosphorus in, II. 334, 336
Potash salts in, II. 322
Potassium iodide in, II. 322, 336, 339
Pyramidon in, II. 333
Quinine in, II. 323, 336
Relief of pain of, II. 324
Rest cure of, II. 323, 339, 340
Rheumatism and gout in, II. 321
Salicylates in, II. 322, 336
Strychnine in, II. 323, 336
Symptoms, II. 319
Thermo-cautery in, II. 326, 340
Two forms of, II. 318
Valerianate of zinc in, II. 330
Veratrine in, II. 334
See also Additional Formulæ, II. 351–53
Neuralgia, Cervico-brachial, II. 342
Neuralgia, Cervico-occipital, II. 342
Neuralgia, Intercostal, II. 342
Neuralgia, Lumbar, II. 343
Neuralgia of the fifth nerve, II. 335–38
Galvanism in, II. 337
Iron in, II. 336
Quinine in, II. 336
Surgical measures in, II. 337
Various drugs in, II. 336
Neuralgia of the sciatic nerve (SCIATICA), II. 338–42
Ice-bag in, II. 341
Massage in, II. 340, 341
Osmic acid in, II. 339
Rest-cure in, II. 339, 340
Sulphur in, II. 340
Symptoms, II. 338
Thermal treatment, II. 341
See also Additional Formulæ, II. 351–53
Neuralgia, Plantar, II. 343
Neurasthenia, II. 444–54
Arsenic in, II. 451
Bromides in, II. 451
Climate in, II. 453
Etiology of, II. 445
General electrisation in, II. 452
Hydrotherapy in, II. 452
Preventive measures in, II. 450
Rest cure in, II. 445–50
Constipation during, II. 450
Diet in, II. 448, 449
Electricity in, II. 448, 449
Insomnia during, II. 449
Isolation in, II. 446
Massage in, II. 448, 449
Regiminal measures in, II. 447, 450–451
Schedule for, II. 450
Neurasthenia (*continued*)
Swedish movements in, II. 450
Symptoms of, II. 444
Toxin cases, II. 452
Traumatic cases, II. 454
Valerian in, II. 451
See also Additional Formulæ, II. 455
Neuritis, Localised, II. 344–47
Baths in, II. 347
Calomel in, II. 346
Causes, II. 344
Electricity in, II. 346
Forms of, II. 345–46
Leeches in, II. 346
Operation for, II. 347
Potassium iodide in, II. 346
Strychnine in, II. 346
Symptoms, II. 345
Neuritis, Multiple, II. 347–51
Alcoholic forms, II. 347, 349–50
Arsenic in, II. 350
Causation, II. 347
Electricity in, II. 351
Massage in, II. 351
Oil of gaultheria in, II. 350
Opium in, II. 350
Sodium salicylate in, II. 350
Strychnine in, II. 350–51
Symptoms, II. 348
Syphilitic cases, II. 350
Neuroses, Cardiac. *See* Angina pectoris, I. 419–34; Cardiac pain, I. 410–19; Palpitation, I. 402–10, 437, 495
Nitrate of silver in catarrhal stomatitis, I. 8
in chronic pharyngeal catarrh, I. 25
in chyluria, II. 202
in diarrhœa, I. 238
in dysentery, I. 262, 264
in gastralgia, I 150
in hæmaturia, II. 198
in jaundice, II. 133
in locomotor ataxy, II. 289
in paraplegia, II. 315
in phthisis, II. 61, 83
in ulcer of the stomach, I. 77
in ulcerative stomatitis, I. 9
in vesicular stomatitis, I. 5
Nitrites in angina pectoris, I. 432
in asthma, I. 570–72
in dyspnœa, I. 378
in epilepsy, II. 405, 406
in mitral stenosis, I. 356
in palpitation of aortic insufficiency, I. 374
Nitroglycerine in aneurism, I. 451
in angina pectoris, I. 430–32
in aortic insufficiency, I. 375–6
in aortic stenosis, I. 371
in Bright's disease, II. 242
in headaches, II. 365

Nitro-hydrochloric acid in hepatitis, II. 163
  in jaundice, II. 134
  in urinary affections, II. 192
Nocturnal perspirations in phthisis. *See* Phthisis, Symptomatic treatment of, II. 56—83
Noma. *See* Stomatitis, Gangrenous, I. 10—11

Œdema of the glottis, I. 517
Œsophagismus. *See* Œsophagus, Spasmodic stricture of the, I. 30—32
Œsophagitis, Acute, I. 29, 30
  Cocaine in, I. 29
  Diet in, I. 30
  Indications for treatment, I. 29
  Opium in, I. 29, 30
  Oxychloride of bismuth (with tragacanth emulsion) in, I. 30
  Rarity of, I. 29
  Symptoms of, I. 29
Œsophagus, Organic stricture of the, I. 32—41
  Arsenic in, I. 35
  Causation of, I. 32
  Creasote in, I. 34
  Food in, I. 35, 37—41
  Forcible dilatation in, I. 33, 34
  Gastrostomy in, I. 35, 37
  Hydrochlorate of cocaine in, I. 34
  Injections in, I. 35
  Iodide of potassium in, I. 34
  Opium in, I. 34
  Rectal feeding in, I. 37—41
  Symptoms of, I. 32, 33
  Thymol in, I. 34
  Tubage in, I 35—36
Œsophagus. Spasmodic stricture of the (ŒSOPHAGISMUS, SPASM), I. 30 - 32
  Antacids in, I. 31
  Aperients in, I. 31
  Asafœtida in, I. 31
  Belladonna in, I. 31
  Bromide of ammonium in, I. 31
  Camphor in, I. 31
  Causes of, I. 30
  Cocaine in, I. 31
  Diet in, I. 32
  Douches in, I. 31
  Electrical stimulation in, I. 32
  Musk in, I. 31
  Oxide of zinc in, I. 31
  Passage of the bougie in, I. 31, 32
  Symptoms of, I. 30, 31
  Valerianate of zinc in, I. 31
  Valerian in, I. 31
Oidium albicans, Development of, I. 5
Oil of wintergreen (*gaultheria*) in multiple neuritis, II. 350
  in rheumatism, II, 564, 569
Olive oil in gall-stones, II. 116
  in hæmorrhage of typhoid fever, II. 689
  in measles, II. 642—44
  in perityphlitis, I. 249
  in scarlet fever, II. 680
  in small-pox, II. 622
Opium in acute endocarditis, I. 335
  in acute gastric catarrh, I. 47, 56
  in acute nasal catarrh, I. 505, 506
  in acute œsophagitis, I. 29, 30
  in acute peritonitis, I. 257—58
  in aneurism, I. 451
  in aortic insufficiency, I. 378
  in appendicitis, I. 246
  in Bright's disease, II. 233
  in bronchial catarrh, I. 532—33
  in cancer of stomach, I. 93, 94
  in cholera, II. 750—51
  in diabetes, II. 529—30
  in diarrhœa, I. 226—28
  in dysentery, I. 257—58
  in enteralgia, I. 178—88, 190
  in epilepsy, II. 416
  in gall-stones, II. 114
  in gastralgia, I. 148
  in gout, II. 503, 505
  in hæmoptysis, II. 78
  in hepatitis, II. 163
  in intestinal obstruction, I. 275—76, 279—80
  in mercurial stomatitis, I. 13
  in neuralgia, II. 328
  in neuritis, II. 358
  in pericarditis, I. 328
  in peritonitis, I, 310, 312—16
  in phthisis, II. 64, 67, 78, 81
  in pneumonia, I. 634, 637
  in pneumothorax, II. 90, 93
  in rheumatism, II. 569—70
  in small-pox, II. 627
  in stricture of œsophagus, I. 34
  in tetanus, II. 734
  in ulcerative stomatitis, I. 9
  in ulcer of the stomach, I. 79, 81
Osmic acid in sciatica, II. 339
Osteo-arthritis. *See* Arthritis Deformans, II. 471—79
Oxalate of cerium in cancer of the stomach, I. 94
  in sea-sickness, I. 189
Oxaluria, II. 190—93
  Alkalies in, II. 192
  Aperients in, II. 192
  Diet in, II. 191, 192
  Hygienic measures in, II. 192
  Mineral waters in, II. 192
  Nitro-hydrochloric acid in, II. 192
  Origin of oxalates in, II. 190
  Relation to dyspeptic states, II. 921
    See also Additional Formulæ, II. 207

- Ox-gall in jaundice, II. 186
- **Oxyuris vermicularis,** I. 298—303
  - Calomel in, I. 302
  - Cause of, I. 299
  - Characteristic symptom, I. 301
  - Enemata in, I. 300, 301
  - Hydrochlorate of cocaine in, I. 301
  - Injections in, I. 300, 301
  - Intestinal tube in, I. 300
  - Mercurial suppository in, I. 301
  - Naphthaline in, I. 301
  - Natural history of, I. 298
  - Olive oil in, I. 301
  - Perchloride of iron in, I. 301
  - Phosphate of iron in, I. 302
  - Purgatives in, I. 301
  - Rhubarb in, I. 302
  - Sulphur in, I. 302
  - Tannin in, I. 301
  - Tonics in, I. 302
  - Treatment, I. 300
- **Ozæna,** or **Atrophic rhinitis,** I. 510—12
  - Cleansing douches in, I. 511
  - Electrical cauterisation in, I. 512
  - Insufflations in, I. 512
  - Paints and sprays in, I. 511—12
  - Scrofulous and syphilitic cases, II. 512
    - *See also* Additional Formulæ, I. 522

- **Palpitation,** I. 402—10, 487, 495
  - Aperients in, I. 409
  - Belladonna in, I. 408, 409, 410
  - Bromides in, I. 408, 409, 410
  - Causes of, I. 403—5
  - Diet in, I. 407
  - Digitalis in, I. 408
  - Enemata in, I. 409
  - Galvanic current in, I. 410
  - Gastric sedatives in, I. 409
  - Ice-bag in, I. 410, 495
  - In exophthalmic goitre, I. 487, 495
  - Iodine in, I. 409
  - Leiter's tubes in, I. 410
  - Nature of, I. 402—3
  - Nux vomica in, I. 408
  - Rest in, I. 407
  - Stimulants in, I. 410
  - Strychnine in, I. 408
  - Valerianate of zinc in, I. 408
    - *See also* Additional Formulæ, I. 434
- **Pancreatic diabetes,** II. 517—18, 533—34
- Papain in dyspepsia, I. 172
- Paracentesis abdominis, Operation of, I. 368 ; II. 165—66
- Paraldehyde in insomnia, II. 376
- Para-monochlorphenol in laryngeal phthisis, II. 87
- **Paralysis, Acute atrophic.** *See* Paralysis, Infantile, II. 296—303
- **Paralysis agitans,** II. 396—99
  - Dietetic and regiminal treatment in, II. 398, 399
  - Drugs in, II. 399
  - Electricity in, II. 398
  - Insomnia in, II. 399
  - Massage in, II. 398
  - Symptoms and course of, II. 397
  - Tonics in, II. 399
- **Paralysis, Bulbar,** II. 315—16
- **Paralysis, Infantile,** II. 296—303
  - Aconite in, II. 298
  - Antipyretics in, II. 298
  - Aperients in, II. 299
  - Chloral in, II. 300
  - Counter-irritation in, II. 298, 299
  - Electricity in, II. 301
  - Ergot in, II. 299
  - Ice-bag in, II. 299
  - Indications for treatment, II. 296
  - Massage in, II. 301
  - Nature and symptoms of, 296—98
  - Orthopædic appliances in, II. 302
  - Phenacetin in, II. 299
  - Potassium bromide in, II. 300
  - Potassium iodide in, II. 299
  - Strychnine in, II. 300
- **Paraplegia,** II. 303—15
  - Anti-tubercular remedies in, II. 314
  - Aperients in, II. 309
  - Borax in, II. 310
  - Causation of, II. 303
  - Cauterisation in, II. 309
  - Chronic spinal meningitis, II. 307
  - Compression cases, II. 306, 313
  - Counter-irritation in, II. 312
  - Cystitis, II. 306
  - Diver's, II. 304, 314
  - Dry- and wet-cupping in, II. 308, 309
  - Elastic extension in, II. 314
  - Electricity in, II. 311
  - Ergot in, II. 311, 315
  - Hydrotherapy in, II. 312
  - Ice-bag in, II. 308, 309
  - Laminectomy for, II. 314
  - Leeches in, II. 308, 309
  - Medicinal agents in, I. 311
  - Myelitis, II. 303, 305, 308
  - Opium and chloroform liniments in, I. 313
  - Potassium iodide in, II. 311
  - Prevention of bed-sores in, II. 309, 310
  - Reflex, II. 304
  - Rest and suspension in, II. 314
  - Salol in, II. 310
  - Secondary spasmodic, II. 314
  - Spastic, II. 315
  - Strychnine in, II. 313

- **Paraplegia** (*continued*)
  - Symptoms, II. 305
  - Syphilis in, II. 303, 304, 311
  - Thermal baths in, II. 312
  - Treatment, II. 307
  - Urotropine in, II. 310
  - Vesical and rectal precautions in, II. 309
  - *See also* Additional Formulæ, II. 317
- **Parasites, Intestinal.** *See* Anchylostomum duodenale, I. 284, 303; Ascaris lumbricoides, I. 284, 296—98; Oxyuris vermicularis, I. 284; Tapeworms, I. 284—96; Trichocephalus dispar, I. 284, 303.
- **Parasitic stomatitis.** *See* Stomatitis, Parasitic, I. 5—8
- **Parkinson's disease.** *See* Paralysis agitans, II. 396–99
- Pelletierine, Tannate of, as a vermicide, I. 298
- **Perforation in ulcer of the stomach,** I. 69—70, 80—84
- **Periarteritis,** I. 436
- **Pericarditis, Acute,** I. 326–31, 339
  - Aconite in, I. 327
  - Acute rheumatism in causation of, I. 326
  - Alkalies in, I. 327
  - Aspiration in, I. 329–30
  - Blisters in, I. 329
  - Causes of, I. 326
  - Convalescence in, I. 330
  - Diet in, I. 329, 331
  - Digitalis in, I. 329
  - Forms of, I. 326
  - Formulæ in treatment of, I. 339
  - Ice-bag in, I. 328
  - Incision in, I. 329—30
  - Indications for treatment, I. 327
  - in scarlet fever, I. 326
  - Iodide in, I. 329
  - Leeches in, I. 328
  - Mercurial inunctions in, I. 329
  - Opium in, I. 328
  - Potassium iodide in, I. 329, 331
  - Quinine in, I. 329
  - Rest-treatment in, I. 327, 331
  - Sodium salicylate in, I. 327–28
  - Symptoms of, I. 327
  - Tuberculous form of, I. 326
  - Warm applications in, I. 329
- **Peritonitis, Acute,** I. 306—17
  - Calomel in, I. 315, 316
  - Causation of, I. 366, 307
  - Creasote in, I. 311
  - Enemata in, 310—12, 314, 316
  - Hydrocyanic acid in, I. 311
  - Hypodermic injections in, I. 310, 313, 314
  - Ice-cold compresses in, I. 309
- **Peritonitis, Acute** (*continued*)
  - Laparotomy in, I. 309, 316
  - Leeches in, I. 312
  - Lime water in, I. 311
  - Nutrient enemata in, I. 311
  - Opium in, I. 310, 312—15, 316
  - Puncture in, I. 311
  - Purgatives in, I. 315, 317
  - Quinine in, I. 312
  - Symptoms, I. 307, 308
  - Treatment, I. 308
  - Turpentine in, I. 311
  - *See also* Additional Formulæ, I. 323, 324
- **Peritonitis, Tubercular,** I. 317—23
  - Ascites in, I. 318—21
  - Cod-liver oil in, 318, 319, 323
  - Creasote in, I. 323
  - in children, I. 318
  - Iodide of potassium in, I. 322
  - Iodine in, I. 322
  - Iodoform in, I. 318, 319, 320, 321 322
  - Laparotomy in, I. 317, 319, 320, 321, 323
  - Linimentum hydrargyri in, I. 319
  - Symptoms, I. 317
  - Treatment, I. 318
  - *See also* Additional Formulæ, I. 324
- **Perityphlitis,** I. 242, 243, 248—250
  - Aperients in, I. 250
  - Calomel in, I. 250
  - Enemata in, I. 249
  - Fluid magnesia in, I. 250
  - Indication for treatment, I. 248
  - Leeches in, I. 249
  - Meaning and nature, I. 242, 243
  - Sodium sulphate in, I. 250
- **Pernicious malarial fever.** *See* Malarial fevers, II. 713—30
- **Petit mal,** II. 401, 404, 410, 421
- **Pharyngeal catarrh, Acute** (SORE THROAT, ANGINA), I. 19—23
  - Aconite in, I. 21
  - Causes of, I. 20
  - Characters of, I. 19
  - Cocaine in, I. 22
  - Diaphoretic draught in, I. 21
  - Diet in, I. 22
  - Dinneford's fluid magnesia in, I. 21
  - Gargles in, I. 22
  - Inhalation in, I. 23
  - Mistura sennæ composita in, I. 21
  - Quinine in, I. 21, 23
  - Potassium chlorate in, I. 21
  - Septic cases of, I. 21
  - Sprays in, I. 22
  - Suppuration in, I. 20
  - Symptoms of, I. 20

- **Pharyngeal catarrh, Acute** (*continued*)
  - Tonics in, I. 23
  - Ulceration in, I. 20
    - *See also* Additional Formulæ, I. 27
- **Pharygeal catarrh, Chronic** (CHRONIC SORE THROAT), I. 23—27
  - Alkaline waters in, I. 25
  - Arsenical water in, I. 25
  - Caustics in, I. 26
  - Chloride of zinc in, I. 25
  - Ergotin in, I. 26
  - Etiology of, I. 23
  - Gargles in, I. 25, 26
  - Lozenges in, I. 26
  - Nitrate of bismuth in, I. 25, 26
  - Nitrate of silver in, I. 25, 26
  - Pastilles in, I. 26
  - Prophylactic for, I. 27
  - Scrofulous conditions in, I. 25
  - Simple form of, I. 23
  - Sprays in, I. 25, 26, 27
  - Symptoms of, I. 24
  - Tannin in, I. 25
  - Topical astringents in, I. 25
  - Varieties of, I. 23
  - Waters in, I. 24—27
    - *See also* Additional Formulæ, I. 28
- **Pharyngitis, Follicular.** *See* Pharyngeal catarrh, chronic, I. 23—27
- **Pharyngitis, Granular.** *See* Pharyngeal catarrh, chronic, I. 23—27
- **Pharyngitis sicca,** I. 24
- Phenacetin in headaches, II. 361
  - in infantile paralysis, II. 209
  - in influenza, II. 704
  - in locomotor ataxy, II. 289
  - in meningitis, II. 262
  - in neuralgia, II. 333
  - in phthisis, II. 59
  - in pleurisy, I. 649
  - in pneumonia, I. 618
- **Phosphaturia,** II. 193—95
  - Anti-fermentive drugs in, II. 195
  - Bacterial agency in, II. 195
  - Benzoic acid in, II. 195
  - Catheterisation in, II. 194
  - Deposit of amorphous phosphate of lime in, II. 193
  - Deposit of triple phosphate in, II. 194
  - Nitric acid in, II. 194, 195
  - Relation to cystitis, II. 194
  - Relation to vesical calculus, II. 194
  - Urotropin in, II. 195
- **Phthisical cavities,** Surgical treatment of, II. 96—97
- **Phthisis, Climatic treatment in,** II. 1—23
  - "Alpine cure" in, II. 11—15
  - American resorts, II. 5, 6, 16—17
  - Antipodean resorts, II. 16—17
  - British resorts, II. 6, 8, 20—21
  - Cases unsuitable for "Alpine" treatment, II. 15
  - Cases unsuited to climatic treatment, II. 3
  - Climatic stations, II. 5—6
  - Continental resorts, II. 5—7, 12, 15, 16, 18, 19, 21—23
  - Difficulty in selection of climates, II. 1—3
  - Importance of the patient's mode of life, II. 23
  - Intermediate stations in, II. 15—17
  - Maritime climates, II. 19—23
  - North African resorts, II. 6, 17, 18, 22
  - Objects sought in change of climate, II. 4
  - Qualities required in a suitable climate, II. 3—4
  - Resorts:
    - for cases in which the local mischief is limited and quiescent, II. 9—14
    - for chronic and advanced cases, II. 14—19
    - for the prevention of the development of phthisis, II. 7—8
  - Sea voyages, II. 6—11
  - South African resorts, II. 5, 8, 9, 10
    - *See also* List of Sanatoria, II. 98—102
- **Phthisis, Complications of,** II. 85—96
  - Acute tuberculosis, II. 94—96
  - Fistula in ano, II. 93—94
  - Laryngeal phthisis, II. 85—89
  - Pleuritis, II. 89—90
  - Pneumothorax and pyopneumothorax, II. 90—92
- **Phthisis, General medicinal treatment of,** II. 24—54
  - Alkaline hypophosphites in, II. 45—46
  - Antiseptic agents in, II. 27—42
    - Chloroform, II. 30, 37—38
    - Creasotal, II. 37
    - Creasote, II. 30, 33, 34—38
    - Duotal, II. 37
    - Eucalyptol, II. 38
    - Formalin, II. 39, 41, 42
    - Guaiacol, II. 33—36
    - Hetol (or sodium cinnamate), II. 40—42
    - Igazolo, II. 39
    - Inhalations, II. 29—31, 37—39

Phthisis, General medicinal treatment of (*continued*)
    - Injections, II. 35—36, 38—42
    - Innunctions, II. 32, 35
    - Iodine, II. 30 - 33
    - Iodoform, II. 31—32, 36
    - Menthol, II. 38
    - Myrtol, II. 39
    - Protargol, II. 42
    - Thiocal, II. 37
    - Turpentine, II. 37
- Arsenic in, II. 47—48
- Cacodylate of sodium in, II. 48
- Classification of phthisis according to amenability to treatment, II. 24—26
- Cod-liver oil in, II. 49—50
- Conditions favourable to cure, II. 26—27
- Glycerine in, II. 50—51
- Iron in, II. 48—49
- Maragliano's antitoxic serum in, II. 45
- Mineral waters in, II. 51—54
- Nuclein and nucleinic acid in, II. 45
- Tuberculin in, II. 42—45
    - *See also* Additional Formulæ, II. 54 - 55

Phthisis. Indications and prophylaxis in, I. 674—83
- Avoidance of unhealthy occupation, I. 679
- Catarrhal attacks to be guarded against, I. 679
- Dangers of puberty and of the period of rapid development, I. 677—78
- Emaciation in, I. 678—79
- Indications for treatment, I. 674
- Influence of heredity, I. 675—76
- Management of infants and children with phthisical tendencies, I. 676—77
- Measures for preventing the dissemination of infective germs, I. 680—83
- Pulmonary gymnastics, I. 679
- Relationship between soil and phthisis, I. 680
- Risk of auto-infection, I. 680
- Tendency to scrofulous affections, I. 678

Phthisis, Laryngeal, II. 85—89
- Bismuth subnitrate in, II. 86
- Chinosol in, II. 87
- Chloroform in, II. 88, 89
- Cocaine in, II. 87, 88
- Diet in, II. 88
- Dysphagia in, II. 87
- Eucaine in, II. 87, 88
- Formalin in, II. 87
- Inhalations in, II. 86, 88, 89
- Insufflations in, II. 86, 88

Phthisis, Laryngeal (*continued*)
- Intra-tracheal injections in, II. 88
- Iodine in, II. 86
- Iodoform in, II. 86
- Lactic acid in, II. 87
- Menthol in, II. 87
- Morphine in, II. 86, 87, 88, 89
- Orthoform in, II. 86, 88
- Protargol in, II. 87
- Sprays in, II. 86

Phthisis, Regiminal Treatment of, I. 684—96
- Advantages of treatment in sanatoria, I. 684, 690—92
- Air and ventilation, I. 690-91
- Alcohol in, I. 688
- "Alimentation forcée," I. 688
- Bodily exercise, I. 693—94
- Clothing, I. 696
- Cold douches and sponging, I. 695
- Cream in, I. 686
- Daily dietary in, I. 689—90
- Farinaceous foods in, I. 687—88
- Hydrotherapy in, I. 694—95
- Importance of regiminal and hygienic treatment, I. 684, 696
- Inspiration of compressed air, and expiration into rarified air, I. 693
- Koumiss in, I. 686
- Pneumatic treatment, I. 692—93
- Raw meat in, I. 686—87
- Rest in, 691 - 92
- Value of fats and carbohydrates, I. 685
- "Zomo-therapy" in, I. 687

Phthisis, Symptomatic treatment of, II. 56—83
- OF COUGH, II. 64—70
    - Alkaline drinks in, II. 65
    - Belladonna in, II. 67, 68
    - Bromide of potassium in, II. 67
    - Butyl chloral in, II. 67
    - Chloral hydrate in, II. 67
    - Cigarettes in, II. 69
    - Codeina in, II. 68
    - Counter-irritation in, II. 56—57, 67
    - Heroin in, II. 68, 70
    - Inhalations in, II. 66, 69, 70
    - Morphine in, II. 69
    - Nitrate of Silver in, II. 68
    - Opium in, II. 64—65, 67—68
    - Sodium bromide in, II. 67
    - Sprays in, II. 69
    - Syrups in, II. 69
    - Terpine hydrate in, II. 70
- OF DIARRHŒA, II. 81—83
    - Bismuth subnitrate in, II. 82
    - Bismuthi subgallas in, II. 82
    - Castor oil in, II. 82
    - Coto bark in, II. 83

- **Phthisis, Symptomatic treatment** — OF DIARRHŒA (*continued*)
  - Creasote in, II. 82
  - Enema in, II. 83
  - Kino in, II. 82
  - Lime water in, II. 82
  - Liquor calcis saccharatus in, II. 82
  - Nitrate of silver in, II. 83
  - Opium in, II. 83
  - Salicylate of bismuth in, II. 82
  - Sulphate of copper in, II. 83
  - OF DISORDERS OF DIGESTION, II. 80—81
    - Aloetic pill in, II. 81
    - Bismuth in, II. 80
    - Creasote in, II. 81
    - Hydrochloric acid in, II. 80, 81
    - Nux vomica in, II. 80
    - Opium in, II. 81
    - Sodium bicarbonate in, II. 80
    - Spirit of chloroform in, II. 80
    - Strychnine in, II. 80
    - Vegetable bitters in, II. 80
  - OF FEVER, II. 57—59
    - Antipyrin in, II. 58
    - Counter-irritation in, II. 56—57, 58
    - Digitalis in, II. 58
    - Phenacetin in, II. 59
    - Quinine in, II. 58
    - Salicylic acid and sodium salicylate in, II. 58—59
  - OF HÆMOPTYSIS, II. 72—79
    - Acetate of lead in, II. 77
    - Alcohol in, II. 79
    - Aperients in, II. 79
    - Blisters in, II. 79
    - Blood-letting in, II. 79
    - Codeina in, II. 78
    - Cold applications in, II. 78
    - Diet in, II. 74—75, 79
    - Digitalis in, II. 77
    - Ergot in, II. 75, 76
    - Ergotine in, II. 75, 76
    - Ergotinine in, II. 75
    - Gallic acid in, II. 76
    - Heroin in, II. 74
    - Hypodermic injection in, II. 75
    - Inhalations in, II. 78
    - Iodide of potassium in, II. 79
    - Ipecacuanha in, II. 77
    - Morphine in, II. 74, 78
    - Opium in, II. 78
    - Perchloride of iron in, II. 76
    - Prophylactic measures in, II. 79
    - Purgatives in, II. 78
    - Regiminal treatment, II. 74—75
    - Salt in, II. 77
    - Sulphuric acid in, II. 74, 76
    - Tinctura hamamelidis in, II. 76
    - Turpentine in, II. 76
- **Phthisis, Symptomatic treatment of** (*continued*)
  - OF NOCTURNAL PERSPIRATIONS, II. 59—63
    - Agaricine in, II. 63
    - Arsenic in, II. 61
    - Atropine in, II. 63
    - Belladonna in, II. 63
    - Camphoric acid in, II. 63
    - Digitalis in, II. 61
    - Ergot in, II. 63
    - Food at bed-time, II. 61
    - Gallic and tannic acids in, II. 62
    - Hypophosphite of lime in, II. 60
    - Perchloride of iron in, II. 62
    - Phosphoric acid in, II. 62
    - Picrotoxine in, II. 63
    - Pilocarpine in, II. 63
    - Quinine in, II. 61
    - Sponging the body in, II. 61, 63
    - Sulphonal in, II. 63
    - Sulphuric acid in, II. 62
    - Tellurate of sodium in, II. 63
    - Zinc oxide in, II. 62
  - OF VOMITING, II. 70—72
    - Bismuth (with dilute hydrocyanic acid) in, II 72
    - Inhalations in, II. 72
    - Liquor strychniæ in, II. 72
    - Pepsin (with hydrochloric acid) in, II. 72
    - Warm drinks in, II. 71—72
  - *See also* Additional Formulæ, II. 83—84
- Pilocarpine in Bright's disease, II. 290
  - in jaundice, II. 137
  - in phthisis, II. 63
  - Pinol in bronchial catarrh, I. 538, 551
- Piperazine in gout, II. 496
- Pistoja powders in chronic gout, II. 507
- *Plasmodium malariæ* and the dissemination of malarial fevers, II. 714—15
- **Pleurisies**, I. 643—72
  - Classification of, I. 643—44
  - Considerations affecting the treatment of, I. 644
  - SIMPLE DRY, I. 644—46
    - Calomel in, I. 646
    - Counter-irritation in, I. 646
    - "Latent" attacks in the apex of the lung, I. 644—45
    - Leeches in, I. 645
    - Limitation of movement in, I. 645
    - Local applications of cold in, I. 645
    - Opium in, I. 645
    - Sodium sulphate in, I. 646
    - Symptoms in, I. 644—45

Pleurisies (*continued*)
  WITH LARGE EFFUSIONS, I. 651—61
    Dangers in operating in, I. 660
    Method of operating in, I. 658—60
    Paracentesis thoracis in, I. 652
    Physical signs in, I. 651
    Pilocarpine in, I. 652
    Thoracentesis in, I. 653—61
  WITH MODERATELY LARGE EFFUSIONS, I. 649—50
    Change of air in, I. 650
    Counter-irritation in, I. 650
    Diuretics in, I. 650
    Mercurial inunctions in, I. 650
    Paracentesis in, I. 650
  WITH PURULENT EFFUSIONS, I. 661—72
    Antiseptic dressings in, I. 669, 671
    Aspiration in, I. 665
    Bacterial influence in, I. 662—63
    Diagnosis of, I. 662—63
    Drainage methods in, I. 668—69
    Exploratory puncture in, I. 663
    Irrigation in, I. 670—71
    Modes of termination in, I. 663
    Pleurotomy in, I. 666—67
    Re-section of the ribs in, I. 667, 669
    Simple incision in, I. 667
    Typical cases of, I. 671—72
  WITH SMALL EFFUSION, I. 646—49
    Antipyretics in, I. 649
    Aperients in, I. 647, 649
    Calomel in, I. 649
    Counter-irritation in, I. 648
    Diet in, I. 648
    Diuretics in, I. 648
    Iodine in, I. 648
    Leeches in, I. 647,
    Opium in, I. 647, 649
    Tonics in, I. 649
  See also Additional Formulæ, I. 672—73
Pleuritis, II. 89—00
  Anodyne liniments in, II. 89
  Chest-strapping in, II. 89
  Counter-irritation in, II. 89
  Effusions in, II. 90
  Quinine in, II. 90
Pleurodynia. *See* Rheumatism, Chronic muscular, II. 467—71
Pneumatic treatment of asthma, I. 580
  of chronic bronchial catarrh, I. 556
  of phthisis, I. 692—93
Pneumonia, Acute lobar, I. 601—28
  Aconite and aconitine in, I. 611
  Alcohol in, I. 622, 623, 624—28
  Ammonium carbonate in, I. 620, 623

Pneumonia, Acute lobar (*continued*)
  Anti-pneumotoxin in, I. 613
  Antipyrin in, I. 618
  Antiseptic agents in, I. 612—13
  Blood-letting in, I. 620
  Caffeine in, I. 627
  Cardiac failure in, I. 624—25, 627
  Climatic and atmospheric influences in, I. 605
  Cold bath in, I. 615—16, 621
  Convalescence in, I. 628—29
  Cough in, I. 622—23
  Counter-irritation in, I. 628
  Delirium in, I. 621—22
  Diarrhœa in, I. 623—24
  Diet in, I. 624, 625, 628
  Digitalis in, I. 617
  Disinfection in, I. 628
  Dyspnœa in, 619—21
  Ether in, I. 620, 621, 627
  Etiology of, I. 604—6
  "Expectant" method in, I. 607
  Gastric catarrh in, I. 623—24
  Leeches in, I. 619
  Morphine in, I. 619, 621, 622
  Mouth-washes in, I. 628
  Musk in, I. 621—22
  Nervous form of, I. 621
  Ice-bags in, I. 616—17, 619, 621
  Indications for treatment, I. 606
  Inhalation of oxygen in, I. 620
  Inhalation of turpentine in, I. 612—13
  Pain in, I. 619
  Phenacetin in, I. 618
  Physical signs in, I. 603
  Pyrexia in, I. 609—12, 614—15
  Quinine in, I. 608—9, 611—12
  Saline injections in, I. 627—28
  Serum treatment in, I. 613—4
  Sleeplessness in, I. 622
  Sodium salicylate in, I. 619, 627
  Specific germ in the causation of, I. 606
  Stages in, I. 603
  Strumous cases of, I. 628
  Strychnine in, I. 619, 620
  Symptoms of, I. 602—3, 604
  Tartar emetic in, I. 623
  Typical cases of, I. 609
  Venesection in, I. 627
  Vomiting in, I. 624, 625
    See also Additional Formulæ I. 642
Pneumonia, Bilious, I. 623
Pneumonia, Broncho-, catarrhal, or lobular, I. 629—41
  Alcoholic stimulation in, I. 639
  Anatomical lesions in, I. 630
  Apomorphine in, I. 633
  Arsenic in, I. 640
  Benzoate of soda in, I. 633

Pneumonia, Broncho-, catarrhal, or lobular (*continued*)
Calomel in, I. 637
Cardiac stimulants in, I. 639
Causation of, I. 629
Chloral and sodium bromide in, I. 638
Chloral hydrate in, I. 638
Cod-liver oil in, I. 640
Cold affusion in, I. 637
Convalescence in, I. 631, 639—40
Cough in, I. 630—31, 634
Course of, I. 630
Diarrhœa in, I. 631, 637
Diet in, I. 639
Emetics in, I. 633
Expectorant remedies in, I. 635
Exudation into the air-cells in, I. 630
Fever in, I. 631, 635
Hygienic treatment in, I. 639
Hyoscyamine in, I. 638
Hypophosphite of lime in, I. 640
Indications for treatment in, I. 632, 633
Inhalation of oxygen in, I. 638
Iodine in, I. 639
Ipecacuanha in, I. 633
Leeches in, I. 637
Local applications of cold in, I. 636—37
Musk in, I. 638
Opium in, I. 634, 637
Pyrexia of, I. 636
Quinine in, I. 635—36
Sprays in, I. 633
Stimulating embrocations in, I. 635
Strychnine in, I. 638
Suppositories in, I. 638
Symptoms and physical signs in, I. 630—32
Tendencies in severe cases, I. 631
Tincture of aconite in, I. 635
Tonics in, I. 639—40
Turpentine inhalation in, I. 635
Vomiting in, I. 631, 637
Warm saline drinks in, I. 634
See also Additional Formulæ, I. 642
Pneumonias, Secondary, I. 640
Pneumothorax and Pyo-pneumothorax, II. 90—93
Blood-letting in, II. 91
Capillary trocar in, II. 91—92
Injection of morphine in, II. 90, 92, 93
Operations in, II. 91—93
Opium in, II. 90, 93
Quinine in, II. 91, 93
Stimulants in, II. 90
Polio-myelitis, Anterior. *See* Paralysis, Infantile, II. 296—303
Potassium bromide in apoplexy, II. 272
in cardiac palpitation, I. 408
in chorea, II. 392
in diabetes, II. 531
in enteralgia, I. 190
in epilepsy, II. 411
in exophthalmic goitre, I. 493
in infantile paralysis, II. 299
in meningitis, II. 256
in railway sickness, I. 137
Potassium chloride in diphtheria, II. 589
in mercurial stomatitis, I. 12
in small-pox, II. 622
in vesicular stomatitis, I. 4
Potassium iodide in angina pectoris, I. 430
in aneurism, I. 444
in aortic stenosis, I. 371
in apoplexy, II. 271
in asthma, I. 575
in Bright's disease, II. 233
in bronchial catarrh, I. 544
in cerebral tumour, II. 278, 279
in chronic nasal catarrh, I. 511
in emphysema, I. 597
in enteralgia, I. 196
in epilepsy, II. 419
in gout, II. 492—93
in hæmaturia, II. 201
in hydatid cysts, II. 175
in infantile paralysis, II. 299
in jaundice, II. 138
in locomotor ataxy, II. 287, 288
in meningitis, II. 256, 261
in neuralgia, II. 322, 336, 339
in neuritis, II. 146
in organic stricture of the œsophagus, I. 34
in paraplegia, II. 311
in peritonitis, I. 322
in rheumatism, II. 565, 573
in sciatica, II. 339
in whooping-cough, II. 606
Pott's disease in the causation of paraplegia, II. 305
Pulmonary tuberculosis. *See* Phthisis, Treatment of, I. 674—97, II. 1—102
Purpura. II. 552—54
Diet in, II. 554
Hæmorrhage in, II. 554
Henoch's purpura, II. 553
Indications for treatment, II. 554
Often symptomatic, II. 552
Purgative draught in, II. 555
Purpura hæmorrhagica, II. 553
Purpura rheumatica, II. 553, 554
Purpura simplex, II. 553
Pylorectomy for cancer of the stomach, I. 97—98
Pyoktanin in gastric carcinoma, I. 96

Pyridine in angina pectoris, I. 433
in asthma, I. 570
Pyuria and Pyelitis, II. 218–21
Alkalies and salines in, II. 219
Alum-whey in, II. 220
Astringents in, II. 220
Balsamic stimulants in, II. 220
Baths in, II. 219, 20
Causation of, II. 218
Complicated with cystitis, II. 220—21
in gouty and rheumatic subjects, II. 219
in women during the catamenial period, II. 220
Mineral waters in, II. 219
Surgical treatment in, II. 219
Symptoms of, II. 218—19
Tannate of quinine in, II. 220
Tannin in, II. 220
Turpentine in, II. 220
See also Additional Formulæ, II. 222

QUASSIA in oxyuris vermicularis, I. 300
Quinine in bronchial catarrh, I. 536
in cholera, II. 753—54
in diarrhœa, I. 237
in dysentery, I. 262, 264
in enteralgia, I. 192
in exophthalmic goitre, I. 493
in gangrenous stomatitis, I. 11
in hæmoglobinuria, II. 201
in Hodgkin's disease, I. 485
in influenza, II. 702—7
in jaundice, II. 133
in leukæmia, I. 480
in malarial fevers, II. 715, 720—25, 727, 728
in meningitis, II. 262
in nasal catarrh, I. 507
in neuralgia, II. 323, 336
in peritonitis, I. 312
in phthisis, II. 58—61
in pneumonia, I. 608—9, 611—12, 635—36
in rheumatism, II. 572, 575
in scarlet fever, II. 634, 636
in small-pox, II. 621
in typhoid fever, II. 674—77
in ulcerative stomatitis, I. 9
in urinary affections, II. 192, 201, 203
in vesicular stomatitis, I. 4
in whooping-cough, II. 604
Quinsy. *See* Tonsillitis, Acute, I. 13

Rachitis, or **Rickets**, II. 541—46
Arsenic in, II. 546
Carbonate of lime with salicylate of bismuth in, II. 546
Causes of, II. 541—42

Rachitis, or **Rickets** (*continued*).
Cod-liver oil in, II. 544, 546
Dietetic measures in, II. 544—45
Hygienic measures in, II. 545
Indications for treatment, II. 543—44
Iron in, II. 546
Phosphorus in, II. 546
Prevention of deformity in, II. 545
Sodium bromide with chloral in, II. 546
Symptoms of, II. 542—43
See also Additional Formulæ, II. 555
Rectal feeding, General remarks on, I. 37—41
Apparatus for, I. 40—41
Defibrinated blood in, I. 40
Nutrient enemata and suppositories in, I. 38—40
Peptonised food in, I. 37—39
Remittent malarial fever. *See* Malarial fevers, II. 713—30
Renal calculi, II. 209—11
Causation of, II. 211
Composition of, II. 210
Symptoms and consequences of, II. 211
See also Hydro-nephrosis, II. 216—18; Pyuria and pyelitis II. 218–21, *and* Renal colic, II. 212–16
Renal colic, II. 212–16
Alcohol in, II. 213
Alkaline drinks in, II. 215
Causation of, II. 212—13
Chloroform inhalations in, II. 213
Henbane in, II. 213
in children, II. 216
Indications for treatment, II. 213—214
Injections of morphine and atropine in, II. 213
Mineral waters in, II. 214
Operative measures in, II. 216
Opium in, II. 213
Paroxysm in, II. 212
Piperazin in, II. 215
"Solvent" treatment in, II. 214—15
See also Additional Formulæ, II. 222
Resin of copaiba in hepatic ascites, II. 167
Resorcin in cancer of the stomach, I. 93
in diarrhœa, I. 234
in sea-sickness, I. 139
in urinary affections, I. 195
in vomiting, I. 135
Resorts, Climatic. *See* Climatic Resorts.

Respiration, Diseases of the Organs of. *See* Asthma, I. 564—94; Bronchial catarrh, I. 524—61; Emphysema, I. 595—98; Laryngeal catarrh, I. 512—21; Nasal catarrh, I. 502—12; Pleurisies, I. 643—72; Pneumonia, I. 601—41
Respirator (Burney Yeo's) for continuous inhalations, I. 545
Rheumatism, Acute, I. 13, 326, 332—33, 335; II. 556—75
Acetylparamidophenol in, II. 568
Alkalies in, II. 570—72
Aspirin in, II. 568—69
Blisters in, II. 563—64
Cold baths in, II. 573—74
Common cause of pericarditis, I. 326
Complicating endocarditis, I. 332—33, 335
Convalescence from, II. 574—75
Diet in, II. 562, 575
Etiology of, II. 558—59
Hyperpyrexia in, II. 560, 573
Ichthyol ointment in, II. 564
in causation of acute endocarditis, I. 332—33, 335
in causation of pericarditis, I. 326
in causation of tonsillitis, I. 13
Indications for treatment, II. 560
Laudanum lotion in, II. 564
Nature and characters of, II. 556—57, 559
Oil of wintergreen in, II. 564, 569
Opium in, II. 569—70
Paquelin's cautery in, II. 564
Potassium iodide in, II. 573
Preceding acute tonsillitis, I. 13.
Quinine in, II. 572, 575
Relapses in, II. 559, 566
Rest in, II. 561
Salicylates and salicin in, II. 565—69, 572, 575
Salophen in, II. 568
Sodium benzoate in, II. 569
Subacute cases of, II. 557, 560
Symptoms of, II. 557—58
Water in, II. 570
See also Additional Formulæ, II. 576
Rheumatism, Chronic muscular (Myalgia), II. 467—71
Ammonium chloride, in II. 470
Acupuncture in, II. 470—71
Counter-irritation in, II. 469
Dry heat in, II. 469
Hot baths in, II. 469
Local measures in, II. 471
Lumbago in, II. 468
Morphine and atropine in, II. 470
Nature of, II. 468
Pleurodynia in, II. 468
Rest in II. 468
Rheumatism, Chronic muscular (*continued*)
Salicylates in, II. 470
Symptoms of, II. 468
Torticollis (or stiff neck) in, II. 468
See also Additional Formulæ, II. 479—80
Rheumatism, Simple chronic articular, II. 456—67
Anatomical changes in, II. 458
Anodyne applications in, II. 461
Aperients in, II. 466
Aspirin in, II. 466
Cause of, II. 458
Colchicum in, II. 466
Counter-irritation in, II. 460—61
Electricity in, II. 462
Guaiacum in, II. 466
"Heat" treatment in, II. 465
Hot baths in, II. 463, 464
Hot douches in, II. 461, 463, 464
Hydrotherapy in, II. 464
Hygienic and regiminal treatment in, II. 467
Ichthyol in, II. 462
Indications for treatment, II. 459—60
Iron in, II. 466
Massage in, II. 462
Potassium iodide in, II. 465
Salicylates in, II. 465
Salipyrin in, II. 466
Sulphur in, II. 462
Symptoms of, II. 459
Thermal springs for the cure of, II. 463
See also Additional Formulæ, II. 479—80
Rheumatoid arthritis. *See* Arthritis deformans, II. 471—79
Rhinitis hyperæsthetica. *See* Hay fever, I. 589—94
"**Rose cold.**" *See* Hay fever, I. 589—94
Rötheln (Rubella, German measles), II. 644—645

Salicylates in acute rheumatism, II. 565—69, 572, 575
in chronic rheumatism, II. 470
in gout, II, 491
in influenza, II. 706
in neuralgia, II. 322, 336
Salicylic acid in acute rheumatism, II. 565—68
in parasitic stomatitis, I. 7
in phthisis, II. 58, 59
in simple catarrhal stomatitis, I. 3
in ulcerative stomatitis, I 9
Salol in anæmia, I. 471
in appendicitis, I. 251
in cholera, II. 752
in diabetes, II. 532

- Salol in diarrhœa, I. 283
  - in dyspepsia, I. 176
  - in paraplegia, II. 310
  - in tonsillitis, I. 16
  - in typhoid fever, II. 674, 680
- Salophen in rheumatism, II. 568
- Sanatoria for the reception of phthisical (paying) patients, II. 98—102
- Santal oil in bronchial catarrh, I. 550
  - in phosphaturia, II. 195
- Santonica as a vermicide, I. 297
- **Scarlet fever**, II. 627—39
  - Aconite in, II, 631
  - Albuminuria in, II. 638
  - Complications and sequelæ of II. 636—39
  - Diaphoretics in, II. 631
  - Diet in, II. 632
  - Glandular enlargements in, II. 638
  - Indications for treatment, II. 631—36
  - Isolation and disinfection of patient in, II. 629
  - Methods of reducing hyperpyrexia in, II. 633
  - Mild forms of, II. 631—33
  - Otitis media in, II. 637
  - Prophylactic measures, II. 627
  - Quinine in, II. 634, 636
  - Severe forms of, II. 638
  - Sprays, washes, and gargles in, II. 630, 633
  - Stimulants in, II. 635, 636
  - Tenacity of poison of, II. 628
    - *See also* Additional Formulæ, II. 654—656
- Schott (or Nauheim) treatment of cardiac diseases, I. 396—99, 400—1
- **Sciatica.** *See* Neuralgia of the Sciatic nerve, II. 338—42
- **Sclerosis, Amyotrophic lateral,** II. 315—16
- **Sea-sickness**, I. 136—139
  - Abdominal belt in, I. 138
  - Amyl nitrite in, I. 139
  - Atropine in, I. 138
  - Brandy in, I. 138
  - Bromide of ammonium in, I. 137, 138
  - Chloral in, I. 137
  - Chlorobrom in, I. 138
  - Chloroform in, I. 138
  - Cocaine in, I. 137, 138
  - Enemata in, I. 138
  - Ice-bag to spine in, I. 138
  - Iced champagne in, I. 137, 138
  - Indications for relief of, I. 136, 137
  - Iodine tincture in, I. 139
  - Morphine in, I. 138
- **Sea-sickness** (*continued*)
  - Oxalate of cerium in, I. 139
  - Resorcin in, I. 139
    - *See also* Additional Formulæ. I. 150, 151
- **Scurvy** or **Scorbutus**, II. 546—52
  - Causes of, II. 546—48
  - Constipation in, II. 551
  - Curative measures in, II. 550
  - Diarrhœa in, II. 551
  - Importance of dietary in, II. 547, 550—51
  - Infantile cases of, II. 546—47, 549, 551
  - Mouth washes in, II. 551
  - Prophylactic indication in, II. 549—50
  - Salts of potash in, II. 551
  - Symptoms of, II. 548—49
  - Tonics in, II. 551
  - Warm baths and massage in, II. 552
    - *See also* Additional Formulæ, II. 555
- Serum-therapy in diphtheria, II. 592—95
  - in erysipelas, II. 652, 653
  - in tetanus, II. 734, 736, 737
- **Shaking palsy.** *See* Paralysis agitans, II. 396—99
- **Shingles**, II, 342
- **Small-pox**, II. 613—27
  - Antiseptics in, II. 624, 626
  - Chloral and sodium bromide in, II. 623
  - Cinchona bark in, II. 624
  - Complications in, II. 626
  - Confluent cases, II. 624
  - Diaphoretics in, II. 619
  - Diet in, II. 620, 623, 627
  - Dover's powder in, II. 620
  - Eruptive stage, II. 620—23
  - Hæmorrhagic or malignant, II. 623
  - Incubation of, II. 618
  - Indications for treatment, II. 618
  - Initial stage, II. 619
  - Prophylactic measures II. 613—18
  - Quinine in, II. 621
  - Sprays, washes, and ointments in, II. 621—26
  - Stage of regression, II. 626
  - Stage of suppuration, II. 623
  - Vaccination in, II. 617
  - Varioloid, II. 617
    - *See also* Additional Formulæ, II. 654
- Sodium benzoate in diphtheria, II 589
  - in chronic nasal catarrh, I. 512
  - in parasitic stomatitis, I. 7
  - in rheumatism, II. 569
  - in urinary affections, II. 195
  - in whooping-cough, II. 606

Sodium chloride in lithiasis, II. 186
Sodium iodide in cancer of the stomach, I. 96
Sodium nitrite in Bright's disease, II. 232
  in anginal paroxysm, I. 431
  in aortic stenosis, I. 371
Sodium salicylate in acute tonsillitis, I. 16
  in chorea, II. 368.
  in diabetes, II. 532, 536
  in gall-stones, II. 115
  in gout, I. 491
  in headache, II. 359
  in locomotor ataxy, II. 290
  in pneumonia, I. 619, 627
  in urinary affections, II. 195
Sodium sulphate in hepatic congestion, II. 146
Sore throat. *See* Pharyngeal catarrh, acute and chronic, I. 11—27
Sparteine in cardiac disease, I. 355
Spasm of the stomach. *See* Gastralgia, I. 141—51
Spinal caries in the causation of paraplegia, II. 305
Spinal cord, Diseases of the. *See* Ataxy, Progressive locomotor, II. 284—96; Atrophy, Progressive muscular, II. 315—166; Paralysis, Infantile, II. 219—303; Paraplegia, II. 303—59
Splenic leukæmia. *See* Leukæmia, I. 478—82
Stomach, Cancer of the, I. 84—100
  Arsenic in, I. 96
  Atropine in, I. 93
  Cajuput oil in, I. 94
  Causes of, I. 84—85
  Charcoal in, I. 92
  Chloral hydrate in, I. 96
  Codeia in, I. 93
  Colour of the complexion in, I. 86
  Condurango bark in, I. 95—96
  Constipation in, I. 88, 92, 94
  Creasote in I. 92, 93
  Diarrhœa in, I. 88
  Diet in, I. 89—91
  Dilatation of stomach in, I. 92
  Emaciation and anæmia in, I. 87
  Enemata in, I. 90, 91, 94
  Fever in, I. 87
  Frequency of, I. 84
  Gastrectomy in, I. 99—100
  Gastro-enterostomy in, I. 98—99
  Gastrostomy in, I. 97
  Hæmorrhage in, I. 87
  Hydrochlorate of cocaine in, I. 94
  Hydrochloric acid in, I. 88, 93
  Hydrocyanic acid in, I. 94
Stomach, Cancer of the (*continued*)
  Incurability of, I. 84
  Jejunostomy in, I. 99
  Lavage in, I. 92, 94
  Loss of appetite in, I. 86
  Methyl-blue (pyoktanin) in, I. 96
  Morbid fermentation in, I. 92, 93
  Morphine in, I. 93
  Opium in, I. 93, 94
  Oxalate of cerium in, I. 94
  Pain in, I. 86, 93
  Pepsin in, I. 93
  Pylorectomy in, I. 97—98
  Rectal feeding in, I. 90
  Resorcin in, I. 93
  Salicylate of bismuth in, I. 93
  Seat of, I. 85
  Sodium iodide in, I. 96
  Stomach tube in, I. 91
  Symptoms of, I. 86—89
  Thymol in, I. 92
  Tonics in, I. 95
  Vomiting in, I. 87, 93, 94
    See also Additional Formulæ, I. 100
Stomach, Ulcer of the, I. 64—84
  After-treatment of, I. 83
  Alimentation in, I. 71
  Alkaline carbonates in, I. 76—77
  Amenorrhœa in, I. 69
  Average cases of, I. 76
  Bacterial agency in, I. 66
  Bismuth in, I. 77
  Characters of, I. 77
  Chronic cases of, I. 74, 77
  Cicatrisations in, I. 69, 73, 74
  Cocaine in, I. 79
  Constipation in, I. 69
  Creasote in, I. 79
  Diet after recovery, I. 75
  Doubtful cases of, I. 84
  Dyspeptic state in, I. 68
  Ergotine in, I. 80
  Etiology of, I. 65
  Hæmorrhage in, I. 67—68, 70, 80, 81, 82
  Hydrochlorate of morphine in, I. 79
  Importance of rest in, I. 70, 71, 74, 75, 80
  Indication for treatment, I. 70
  Lavage in, I. 74
  Leeches in, I. 80
  Leube's soluble meat in, I. 73
  Mortality of, I. 81, 82
  Nitrate of silver in, I. 77—78
  Objection to the use of the tube in, I. 77
  Obliteration of vessels in, I. 65
  Opium in, I. 79, 81
  Pain in, I. 66—67, 79
  Perchloride of iron in, I. 78

Stomach, Ulcer of the (*continued*)
  Perforation in, I. 64, 65, 69, 70, 80—81
  Rectal feeding in, I. 72, 75
  Surgical measures in, I. 81—83
  Symptoms of, I. 66—70
  Thrombosis of vessels in, I. 65
  Transfusion in, I. 80
  Treatment after recovery, I. 83
  Vomiting in, I. 67
    See also Additional Formulæ, I. 100
Stomatitis, Gangrenous, I. 10, 11
  Alcohol in, I. 11
  Carbolic acid in, I. 11
  Carbolic oil in, I. 11
  Cauterisation in, I. 10, 11
  Chlorinated soda in, I. 11
  Concomitant of other diseases, I. 10
  Cupric sulphatis in, I. 11
  Diet in, I. 11
  Fatality of, I. 10
  Hydrochloric acid in, I. 11
  Iodoform in, I. 10
  Mercuric nitrate in, I. 11
  Nutrient enemata in, I. 11
  Paquelin's cautery in, I. 11
  Perchloride of iron in, I. 11
  Quinine in, I. 11
  Subnitrate of bismuth in, I. 11
  Symptoms of, I. 10
Stomatitis materna, I. 4
Stomatitis, Mercurial, I. 11—13
  Acetate of lead in, I. 12
  Belladonna in, I. 12
  Borax in, I. 12
  Causation of, I. 11, 12
  Cauterisation in, I. 12
  Coal-tar in, I. 12
  Creasote water in, I. 12
  Diet in, I. 13
  Hypodermic injection of atropine in, I. 12
  Iodine in, I. 12
  Mouth washes in, I. 12
  Nitric acid in, I. 13
  Nutrient enemata in, I. 13
  Opium in, I. 13
  Potassic chlorate in, I. 12
  Quinine in, I. 13
  Symptoms of, I. 12
  Tannin in, I. 12
  Tincture of cinchona in, I. 12
  Tinture of myrrh in, I. 12
  Tonics in, I. 13
    See also Additional Formulæ, I. 28
Stomatitis, Parasitic (APHTHÆ, THRUSH), I. 5—8
  Argentic nitrate in, I. 7
  Borax in, I. 7
Stomatitis Parasitic (*continued*)
  Calomel in, I. 7
  Carbolic acid in, I. 7
  Causes of, I. 5, 6
  Contagious, I. 6
  Cupric sulphate in, I. 7
  Diet in, I. 7
  Glycerine in, I. 7
  Salicylic acid in, I. 7
  Sulphurous acid in, I. 7
  Symptoms of, I. 5, 6
  Tonics in, I. 8
    See also Additional Formulæ, I. 28
Stomatitis, Simple catarrhal, I. 2, 3
  Barley water in, I. 2
  Bicarbonate of soda in, I. 2
  Bismuth and alkalies in, I. 2
  Borax tabloids and washes in, I. 3
  Boric acid in, I. 3
  Causation of, I. 2
  Corrosive sublimate in, I. 3
  Eucalyptus in, I. 3
  Gum water in, I. 2
  Hydrastis in, I. 3
  Lime water in, I. 3
  Mouth wash in, I. 3
  Nitrate of silver in, I. 3
  Solution of alum in, I. 3
  Symptoms of, I. 2
Stomatitis, Ulcerative, I. 8—9
  Alum in, I. 9
  Boric acid in, I. 9
  Causation of, I. 8
  Cocaine in, I. 9
  Cod-liver oil in, I. 9
  Diet in, I. 9
  Glycerine of borax in, I. 9
  Iodoform in, I. 9
  Nitrate of silver in, I. 9
  Opium in, I. 9
  Potassium chlorate in, I. 9
  Quinine in, I. 9
  Salicylic acid in, I. 9
  Symptoms of, I. 8
  Tincture of iodine in, I. 9
  Tincture of myrrh in, I. 9
    See also Additional Formulæ, I. 27
Stomatitis, Vesicular, I. 3—5
  Causation of, I. 4
  Cupric sulphate in, I. 5
  Diet in, I. 5
  Iodoform in, I. 5
  Kino powder in, I. 4
  Lapis divinus in, I. 5
  Local treatment of, I. 4
  Mercuric chloride in, I. 5
  Nitrate of silver in, I. 5
  Potassium chlorate in, I. 4
  Quinine in, I. 4
  Rhubarb and magnesia in, I. 4
  Sodium bicarbonate in, I. 4

Stomatitis, Vesicular (*continued*)
Subnitrate of bismuth in, I. 4
Symptoms of, I. 3
Washes in, I. 4, 5
Zinc sulphate in, I. 5
See also Additional Formulæ, I. 28
Storax in bronchial catarrh, I. 549
Strophanthus in cardiac dropsy, I. 364
in cardiac valvular lesions, I. 358
in exophthalmic goitre, I. 493
Strychnine in Addison's disease, I. 486
in angina pectoris, I. 429
in apoplexy, II. 267
in ascites of liver complaint, II. 167
in asthma, I. 577
in Bright's disease, II. 249
in bronchial catarrh, I. 537
in cardiac dilatation, I. 386, 387
in cardiac palpitation, I. 417
in cardiac valvular lesions, I. 356
in chorea, II. 389
in dyspepsia, I. 172
in fatty degeneration of the heart, I. 391
in gastralgia, I. 146
in gastro-ectasis, I. 114
in infantile paralysis, II. 300
in influenza, II. 710
in jaundice, II. 188
in malarial fevers, II. 729, 730
in myxœdema, I. 499
in neuralgias, II. 328
in neuritis, II. 346, 351
in paralysis of diphtheria, II. 596
in paraplegia, II. 318
in pneumonia, II. 619, 620, 638
in urinary affections, II. 192, 205
Sub-mammary pain, I. 411
Sulphonal in diabetes, II. 532
in insomnia, I. 370; II. 375
in neurasthenia, II. 449
in phthisis, II. 68
Sulphur in intestinal parasites, I. 302
in rheumatism, II. 461, 465
in sciatica, II. 342
Sulphur dioxide as a disinfectant in malarial fever, II. 717
Sulphurous acid in parasitic stomatitis, I. 7
in typhoid fever, II. 678
Suppurative tonsillitis. *See* Tonsillitis, Acute, I. 13—18
Swedish movements in neurasthenia, II. 449
Syphilitic cirrhosis, II. 168

Tabes dorsalis. *See* Ataxy, Progressive locomotor, II. 284—96
Tachycardia, I. 405
Tænia echinococcus in relation to hydatid cysts, II. 171—73
Tænia mediocanellata, I. 284
Tænia saginata, I. 284, 286, 288, 289
Tænia solium, I. 284—86, 288—89
Tannin in acute pharyngeal catarrh, I. 22
in bronchitis putrida, I. 553
in cholera, II. 758
in chronic laryngeal catarrh, I. 519
in chronic enlargement of tonsils, I. 19
in diarrhœa, I. 229; II. 83, 688
in epistaxis of measles, II. 644
in mercurial stomatitis, I. 12
in oxyuris vermicularis, I. 301
in typhoid fever, II. 685, 689
Tapeworms, I. 284—296
Castor oil in, I. 291, 293, 294, 295
Chloroform in, I. 295
Creolin in, I. 295
Diagnosis, I. 287
Filix-mas in, I. 291
Kamala in, I. 294
Koussin in, I. 292
Kousso in, I. 292
Laxatives in, I. 290
Naphthaline in, I. 295
Natural history of, I. 284—290
Pomegranate in, I. 292
Preparatory treatment, I. 290, 291
Prophylaxis, I. 296
Pumpkin seeds in, I. 294
Symptoms, I. 287
Tannate of pelletierine in, I. 293
Thymol in, I. 294
Turpentine in, I. 293
See also Additional Formulæ, I. 304
Tar in bronchial catarrh, I. 546—48
Tartarised antimony in acute bronchial catarrh, I. 526, 531
Tellurate of soda in phthisis, II. 68
Tetanus, II. 730—37
Alcohol in, II. 733
Antiseptics in, II. 732, 733
Antitoxin treatment in, II. 731, 734, 736, 737
Atropine in, II. 734
Bacillus of, II. 730
Carbolic acid in, II. 734
Chloral in, II. 733, 735
Chloroform in, II. 733
Concentrated fluid food in, II. 733
Cultivation of the bacillus of, II. 731
Enemata in, II. 733
Locked jaw or trismus in, II. 732
Morphine in, II. 734, 735
Nitrite of amyl in, II. 734
Opium in, II. 734
Potassium bromide in, II. 733

Tetanus (*continued*)
Summary of indications for treatment, II. 736
Symptoms, II. 782
Various drugs in, II. 734
Tetronal in insomnia, II. 376
Thrombosis. *See* Apoplexy, II. 268—75
Thrush. *See* Stomatitis, Parasitic, I. 5—8
Thymol in cancer of stomach, I. 92
as a tæniacide, I. 294
in chyluria, II. 202
in gastro-ectasis, I. 113
in organic stricture of the œsophagus, I. 84
in typhoid fever, II. 674, 679
Thyroid treatment of myxœdema, I. 497
Thyroidectomy for exophthalmic goitre, I. 494
Tobacco, Abuse of, in causation of cardiac affections, I. 342, 381, 428
of chronic pharyngeal catarrh, I. 23, 24
in stomatitis, I. 2
Tonsillitis, Acute (Quinsy), I. 13—18
Aconite in, I. 15
Ammonii acetatis liquor in, I. 15
Aperients in, I. 15, 16
Borax in, I. 17, 18
Calomel in, I. 15
Causes of, I. 13
Cocaine in, I. 17
Diet in, I. 18
Dinneford's fluid magnesia in, I. 15
Fomentations in, I. 17
Gargles in, I. 17, 18
Guaiacum in, I. 16
Inhalations in, I. 17
Ipecacuanha in, I. 16
Preceding rheumatic fever and rheumatism, I. 13, 14
Prophylactic in, I. 18
Quinine in, I. 17
Salol in, I. 16
Scarification in, I. 16
Sodium salicylate, I. 16
Suppuration in, I. 14, 15, 17
Symptoms of, I. 14
Tonics in, I., 17, 18
Waters in, I. 18
See also Additional Formulæ, I. 27
Tonsillitis, Chronic (Hypertrophy), I. 18—19
Deafness in, I. 18
Excessive bleeding in, I. 19
Gargles in, I. 19
Glycerine of tannin in, I. 19
Removal of organs in, I. 19
Tonsillitis, Follicular, I. 19
Torticollis. *See* Rheumatism, Chronic muscular, II. 467—71
Tracheotomy for diphtheria, II. 592
for œdema of the glottis, I. 517
in ulcer of the stomach, I. 80
Transfusion in acute anæmia, I 470
Tribromophenol in cholera, II. 752
Tricocephalus dispar, I. 284, 308
Tubercular Peritonitis. *See* Peritonitis, Tubercular, I. 317—28
Tuberculin in phthisis, II. 42—45
Tuberculosis, Acute, II. 94—96
Blisters and blood-letting in, II. 94—95
Bromohydrate of quinine in, II. 94
Cold spongings in, II. 94, 95
Diet in, II. 95
Salicylic acid in, II. 94
Stimulants in, II. 95
Tumour, Cerebral, II. 275—82
Etiology, II. 276
Focal symptom, II. 277
Forms of, II. 276
Hypodermic injections in, II. 279
Mercury in, II. 278, 279
Potassium and sodium iodides in, II, 278, 279
Surgical measures in, II. 280
Symptoms, II. 277
Treatment, II. 278
Turpentine as a tæniacide, I. 298
in apoplexy, II. 269
in bronchial catarrh, I. 544 - 46, 548
in broncho-pneumonia, I. 685
in chronic laryngeal catarrh, I. 519
in gall-stones, II. 116, 117
in jaundice, II. 186
in laryngeal diphtheria, II. 591
in nasal diphtheria, II. 590
in phthisis, II. 87, 76
in phosphaturia, II. 195
in typhoid fever, II. 680
in whooping-cough, II. 604
Typhlitis. *See* Perityphlitis, I. 248—58
Typhoid, or **Enteric fever,** II. 657—98
Antiseptic treatment, II. 673
Aperients in, II. 678
Bacillus of, II. 657—59
Bed-sores in, II. 691
Boric acid in, II. 674
Calomel in, II. 677
Carbolic acid in, II. 674, 679, 680
Carbonate of guaiacol in, II. 680
Characteristic lesions of, II. 660

Typhoid, or **Enteric fever** (*continued*)
  Chlorine in, II. 674—77
  Chloroform in, II. 679
  Corrosive sublimate in, II. 666, 674
  Course of, II. 661—63
  Diarrhœa in, II. 687
  Diet in, II. 669—72
  Diffusion of, II. 659
  Hæmorrhage in, II. 688
  High temperature in, II. 683
  Hydrotherapy in, II. 683—87
  Indications for treatment, II. 668, 673
  Iodine in, II. 674
  Laparotomy in, II. 689
  Maintenance of patient's strength in, II. 668
  Naphthalin in, II. 674
  Naphthols in, II. 679
  Nature and origin of, II. 657—60
  Nervous symptoms, II. 691
  Oil of eucalyptus in, II. 680
  Perforation of the intestine in, II. 689
  Prophylaxis and disinfection, II. 665—67
  Protective inoculation against, II. 663
  Quinine in, II. 674—77
  Salicylate of bismuth in, II. 679
  Salol in, II. 674, 680
  Stimulants in, II. 672, 690
  Sulphurous acid in, II. 674, 678
  Symptoms, II. 661
  Treatment of complications of, II. 683
  Treatment of convalescence from, II. 692
  Turpentine in, II. 674, 680
  Urotropine in, II. 674, 682
    See also Additional Formulæ, II. 697, 698
Typhus fever, II. 693—97
  Course of, II. 694 - 95
  Diet in, II. 696
  Diffusion of, II. 693
  Hypodermic injections in, II. 696
  Incubation period, II. 693
  Open-air treatment, II. 696
  Quinine in, II. 695
  Treatment, II. 695
    See also Additional Formulæ, II. 698

Uræmia, in Bright's disease, II. 225, 234—35
Urethane in insomnia of cerebral congestion, I. 370
Urinary and renal affections.
  See Albuminuria, II. 203—7; Bright's disease, II. 233—51;
Urinary and renal affections (*continued*)
  Chyluria, II. 201—3; Hæmaturia, II. 195—99; Hæmoglobinuria, II. 199—201; Hydronephrosis, II. 216—18; Lithiasis, II. 180—90; Oxaluria, II. 190—93; Phosphaturia, II. 193—95; Pyuria and Pyelitis, II. 218—21; Renal calculi, II. 209—11; Renal colic, II. 212 - 16
Utero-gestation. *See* Vomiting, I. 132—141

VALERIANATE OF ZINC in angina pectoris, I. 429
  in cardiac palpitation, I. 408
  in chorea, II. 392
  in enteralgia, I. 192
  in exophthalmic goitre, I. 498
  in gastralgia, I. 146
  in hysteria, II. 434
  in hysterical aphonia, II. 443
  in neuralgia, II. 324
Veratrine in neuralgia, II. 331
Vomiting, I. 132—141
  Anæsthetic remedies in, I. 135, 137, 138, 140, 141
  Anti-fermentives in, I. 133
  Carbolic acid in, I. 135, 136
  Cocaine in, I. 135, 138, 140
  Chlorobrom in, I. 138
  Chloroform in, I. 138
  Creasote in, I. 136, 139
  Enema in, I. 139
  Ether spray in, I. 140
  Hydrocyanic acid in, I. 135
  Hyperæsthesia in, I. 134
  Ingluvin in, I. 140
  Lime water in, I. 135
  Menthol in, I. 135, 139
  Oxalate of cerium in, I. 139
  Pathology of gastric irritability in, I. 134
  Prevention of, I. 133, 134
  Periodical vomiting, I. 141
  Resorcin in, I. 135
  Sea-sickness, I. 136—139
  Utero-gestation, I. 139
    See also Additional Formulæ, I. 105, 151

Whooping-cough, II. 599—610
  Anti-catarrhal and sedative measures in, II. 606
  Antiseptics in, II. 602—6
  Atropine in, II. 607
  Belladonna in, II. 607
  Benzoate of soda in, II. 606
  Bourboule water in, II. 606
  Bromoform in, II. 606
  Carbolic acid inhalations in, II. 602

Whooping-cough (*continued*)
  Chloral in, II. 608
  Chloroform in, II. 608
  Cocaine in, II. 608
  Diet and change of air in, II. 608, 609
  Indications for treatment, II. 602
  Inhalations and sprays in, II. 602—6
  Morphine in, II. 607

Whooping-cough (*continued*)
  Nature, characters, and symptoms, II. 599—602
  Potassium iodide in, II. 606
  Prophylaxis for, II. 609
  Quinine in, II. 604
    See also Additional Formulæ, II. 611, 612

"ZOMO-THERAPY" in phthisis, I. 687

PRINCIPAL AUTHORITIES QUOTED OR REFERRED TO.

Adam, Dr., on asthma, I. 567, (*note*), 579

Adams, S. A., on irrigation by submersion in pleurisy, I. 670

Allbutt, Dr. Clifford, on acute dilatation of the stomach, I. 106; on colic, I. 192; on neurasthenia, II. 445, 451; on operation in tubercular meningitis, II. 259; on phthisical cavities, II. 97

Allbutt, M. J., on migraine, II. 357

Anders, Prof., on creasote in phthisis, II. 85; on saline injections in pneumonia, I. 628; on sulphate of cinchonidine in malaria, II. 725

Anderson, Dr. (Mrs.) G., on neurasthenia, II. 445, 452

Anderson, Prof. McCall, on cure of acute tuberculosis, II. 94, 95, 96

Baccelli on carbolic acid in tetanus, II. 734; on quinine in malaria, II. 724

Balfour, Dr., on aneurism, I. 444; on angina pectoris, I. 429, 431, 432, 433; on cardiac pain, I. 411; on digitalis in aortic disease, I. 375

Bamberger on after-treatment of gastric ulcer, I. 83; on migraine, II. 359; on ozæna, I. 511; on whooping-cough, II. 607

Banks, Dr., on scurvy, II. 548

Bardet on sciatica, II. 328

Barlow on meningitis, II. 261; on scurvy, II. 549

Barrs, Dr., on digitalis in aortic disease, I. 375; on ice-bag in pneumonia, I. 617

Bartels, Prof., on potassium iodide in chronic interstitial nephritis, II. 248

Bartholow, Prof., on arsenic in phthisis, II. 47; on chloroform in neuralgia, II. 351; on epilepsy, II. 421

Bauer, Prof., on carcinoma of the stomach, I. 91; on diet in anæmia, I. 460; on milk in diabetes, II. 522

Bazire on epilepsy, II. 406

Behring and Kitasato's "anti-toxin serum" method in diphtheria, II. 592-95

Beneke on gall-stones, II. 108, 109

Bennett, Sir W., on operation in dilatation of stomach, I. 122; on osmic acid in neuralgia, II. 333, 334

Bergmann on indications for operation in cerebral tumour, II. 280, 281; on operations in epilepsy, II. 424

Bernard, Claude, on diabetes, II. 514

Besnier on chloroform in neuralgia, II. 331

Bianchi on antiseptics in small-pox, II. 621

Biot on milk diet in acute rheumatism, II. 562

Boas on sodium iodide in œsophageal cancer, I. 96

Bokenham on effects of serum treatment of pneumonia, I. 618

Bouchard, Prof., on apoplexy, II. 265; on cause of epilepsy, II. 403; on congestion of the liver, II. 144; on creasote in phthisis, II. 84; on dietary in dilatation of the stomach, I. 109; on gout, II. 486, 491, 494; on jaundice, II. 136; on relation of dilatation of stomach to congestion of liver, II. 144; on typhoid fever, II. 677, 678

Bouchardat on diabetes, II. 521, 523

Bouchat on chloral in chorea, II. 394

Bourneville on bromide of camphor in chorea, II. 393

Bradbury, Prof., on angina pectoris, I. 433; on hypnotism in insomnia, II. 377

Bramwell, Byrom, on arsenic in anæmia, I. 473; on operation for cerebral tumour, II. 280, 281

Brandis on rheumatism, II. 465

Bridge, Prof. N., on insufflations of quinine in diphtheria, II. 605

Brieger, tetanus bacillus cultures, II. 731

Bristowe on ascites, II. 164, 168

Broadbent, Sir W., on alkalies in endocarditis, I. 334; on aortic disease, I. 369, 376; on cardiac dilatation, I. 384, 388; on epilepsy, II. 414, 415 (*note*); on gastro-ectasis, I. 102, 113; on palpitation, I. 410

Broca on appendicitis, I. 244, 245, 251

Brockbank, Dr., on action of olive oil, II. 116

Brouardel on diffusion of phthisis, I. 680

Browne, Crichton, on epilepsy, II. 406

Bruce on diabetes, II. 529

Buchanan, Sir G., on infectiveness of influenza, II. 712

Burt, Prof. Smith, on tub bath in typhoid fever, II. 685

Buss on salicylic acid in acute rheumatism, II. 565

CAMPI, DR. NUMA, on tapeworm, I. 295

Carter, Dr., on acute nephritis, II. 235; on anæmia, I. 474; on dyspepsia, I. 170

Caton, Dr., on acute rheumatic endocarditis, I. 326

Cave, Dr. E. J., on rheumatism, II. 473

Cervello, Prof., on phenocoll in malaria, II. 725; treatment of phthisis, II. 39

Charcot, Prof., on apoplexy, II. 265; on electricity in exophthalmic goitre, I. 492; on ergot in locomotor ataxy, II. 289; on hysteria, II. 426, 428, 429, 435, 439; on paralysis agitans, II. 399

Charteris, Prof., on carbolic acid in typhoid fever, II. 679; on impurities in salicylic acid, II. 566

Cheadle, Dr., on tapping in ascites, II. 164, 165

Cheyne, Prof. Watson, on tubercular peritonitis, I. 319, 320, 321; on operation for pleurisy, I. 671

Church on ergot in locomotor ataxy, II. 289

Churton, Dr., case of chorea, II. 395

Clarke, Dr. M., on anti-streptococcus serum in malignant endocarditis, I. 339

Clarke, Prof. C. R., on insomnia, II. 378

Coghill, Dr., on antiseptic inhalations in phthisis, II. 29, 30

Cohen, Prof. Solis, on asthma, I. 578; on chronic laryngeal catarrh, I. 519; on hay asthma, I. 593; on inspiration of medicinal vapours, I. 545; on phthisis, II. 29, 30, 31, 86, 88

Cohnheim, Paul, on olive oil in gastro-ectasis, I. 122

Colasanti, Prof., on jambul in diabetes, II. 532

Collins, Prof. J., on chorea, II. 389; on epilepsy, II. 417, 419

Cornil on arsenic in phthisis, II. 47

Councilman on *amœbæ coli*, II. 150

Crandall, statistics of anti-toxic treatment of diphtheria, II. 595

Curschmann on baths in typhoid fever, II. 686, 687; on open-air treatment of typhus, II. 696

Cushing on laparotomy in typhoid fever, II. 690

DA COSTA on asepsis in surgical procedures, II. 733; on cause of irritable heart, I. 404; on epilepsy, II. 406; on santal oil in bronchiectasis, I. 550; on treatment of leukæmia, I. 481

Dana on trifacial neuralgia, II. 335 336

Daremberg's peptonised enemata in stricture of the œsophagus, I. 39

Davies, Dr. H., on blisters in acute rheumatism, II. 563

Davis, Prof. N. S., on piperazin, II. 215

Dawson, Dr., on protein bread for diabetics, II. 524

Deaver on neuritis, II. 347

Débove on sciatica, II. 328; on stomach syphon, I. 115

D'Estrées, Dr., on Contrexéville water for diabetics, II. 528

Dickinson on interstitial nephritis, II. 249, 250; on Turkish baths in chronic nephritis, II. 243

Dietl, treatment of pneumonia, I. 607

Dieulafoy, Prof., on gout, II. 494; on thoracentesis in pleurisy, I. 660

Donkin, Scott, on milk in diabetes, II. 522

Dreschfeld, method of rectal feeding, I. 39; on antiseptics in phthisis, II. 29, 31; on gastric ulcer, I. 69, 73

Druitt on hæmoglobinuria II. 201

Dujardin-Beaumetz on acute rheumatism, II. 566; on aneurism, I. 450; on arsenic in phthisis, II. 47; on bread for diabetics, II. 524; on caffeine in cardiac disease, I. 354; on chronic diarrhœa, I. 237; on dysentery, I. 265; on gout, II. 491, 494; on hydatid cysts, II. 177 (and *note*); on hysteria, II. 429, 431, 432, 437; on injection of cold water in jaundice, II. 133; on iron lost by the blood, I. 468; on lithiasis, II. 188; on mortality in hepatic abscess, II. 154; on neuralgia, II. 331; on nutrient enemata I. 38;

on paraplegia, II. 313; on rheumatism, II. 474; on sciatica, II. 344; on small-pox, II. 652; on the term "dyspepsia," I. 152; on tubercular meningitis, II. 256; on typhoid fever, II. 680

EADE, SIR PETER, on induced electric current in asthma, I. 580
Ebstein on bread for diabetics, II. 524, 525; on gout, II. 490, 496, 499, 500
Einhorn, Max, on electrisation of stomach in dyspepsia, I. 179; on galvanic current in gastralgia, I. 147; on gastric cancer, I. 88, 95, 96; on gastrodiaphany in dyspepsia, I. 177, 178; stomach bucket in dyspepsia, I. 174, 175; on ulcer of stomach, I. 67, 68
Erb, on electricity in locomotor ataxy, II. 291; on osteo-arthritis, II. 476; on paralysis agitans, II. 399; on paraplegia, II. 309, 315
Esbach on oxaluria, II. 190
Estländer, operation in pleurisy, I. 672
Ewald on bismuth in ulcer of stomach, I. 77; on causation of acute gastric catarrh, I. 42; on charcoal in cancer of stomach, I. 92; on chloral hydrate in gastric cancer, I. 96; on condurango in gastric cancer, I. 96; on diarrhœa in acute gastric catarrh, I. 48; on dilatation of stomach, I. 108, 109, 110, 114; on examination of contents of stomach, I. 176; on gastralgia, I. 145, 149; on gastric juice in ulcer of stomach, I. 68 (*note*); on hydrochloric acid in carcinoma, I. 88 (*note*); on hydrochloric acid in gastric catarrh, I. 58; on intravenous injections of hetol in phthisis, II. 40, 41; on lavage in ulcer of stomach, I. 70, 71; on migranin in headache, II. 361; on nutriment in dilatation of stomach, I. 174; on rectal feeding, I. 39
Ewart, Dr., on protargol in phthisis, II. 42

FAGGE on bleeding in acute pericarditis, I. 828; on bleeding in apoplexy, II. 269; on chloral in chronic Bright's disease, II. 250; on galvanism in exophthalmic goitre, I. 491; on gout, II. 494; on hæmoglobinuria, II. 200; on hydatid cysts, II. 173, 176, 177; on hysteria, II. 434; on linimentum hydrargyri in tubercular peritonitis, I. 319; on methyl-chloride in lumbago, II. 469; on operation for abscess of liver, II. 154; on paraplegia, II. 313, 315
Fardel, Durand, on Vichy water in gout, II. 498
Fenwick, Dr., on method of cooling air round patient, II. 685
Fenwick, H., on hæmaturia, II. 196
Fergusson on hypodermic injections in malaria, II. 723
Flechsig, method in epilepsy, II. 416
Fleiner on bismuth in gastric ulcer, I. 77
Fleury on cause of epilepsy, II. 420
Flick on phthisis, I. 686; II. 32, 33, 34, 35
Fonssagrives on arsenic in phthisis, II. 47
Forchheimer on use of calomel in parasitic stomatitis, I. 7
Fournier, Mons., on origin of gall-stones, II. 106
Fowler, Prof., on purgatives in acute peritonitis, I. 315
Fox, Dr. Wilson, on bleeding in acute bronchial catarrh, I. 580; on broncho-pneumonia, I. 635, 636; on cold baths in hyperpyrexia of acute rheumatism, II. 573; on pneumonia, I. 614, 615, 617, 621, 626; on use of antiseptics in phthisis, II. 28, 31, 69
Foxwell, Dr., on iodoform in phthisis, II. 32
Fraentzel, Dr., on acute rheumatism, II. 563; on mercurial inunction in pleurisy, I. 650 (*note*); on operation for pneumothorax, II. 91
Fränkel on locomotor ataxy, II. 293; on mercurial inunction, in aneurism, I. 450; on raw meat in phthisis, I. 687
Fraser, Prof., on nitrites in asthma, I. 585; on treatment of pernicious anæmia, I. 474
Frazer on diabetes, II. 529
Frerichs, Dr., on origin of gall-stones, II. 108
Friedreich, Dr., on condurango in cancer of stomach, I. 95; on quinine in exophthalmic goitre, I. 493
Fuller on acute rheumatism, II. 571
Fuster, Prof., on raw meat in phthisis, I. 686

GAREL, DR., on hay asthma, I. 594
Garrod on acute rheumatism, II. 571; on gout, II. 487, 489, 491, 496, 506; on iodide of iron in osteo-arthritis, II. 477; on scurvy, II. 547

Gautier, Prof. A., on arsenic in malaria, II. 725; on cacodylate of sodium in phthisis, II. 48
Gerhardt on after-treatment of gastric ulcer, I. 83; on condurango in cancer of stomach, I. 95; on jaundice, II. 133, 134; on manual compression in bronchial catarrh, I. 554; on perchloride of iron in ulcer of stomach, I. 78
Gibson, Mr., on angina pectoris, I. 433; thyroid grafting in myxœdema, I. 498
Gilbert, Mons., on origin of gallstones, II. 106 (*note*)
Giraldes, Dr., on chloral for seasickness, I. 137
Godlee, Mr., on draining cavity in pyopneumothorax, II. 93; on operation for abscess of liver, II. 153, 155
Gowers, case of trigeminal neuralgia, II. 384; on epilepsy, II. 402, 406, 411, 413, 416—18, 423; on massage in infantile paralysis, II. 301; on neuritis, II. 346; on paralysis agitans, II. 396 *et seq.*; on strychnine in progressive muscular atrophy, II. 316
Grant, Sir James, on operation for neuralgia, II. 470, 471
Graves, Dr., on calomel and opium in acute peritonitis, I. 315; on gout, II. 489, 490; on pathological nature of rheumatism, II. 557
Gull, Sir W., anorexia nervosa, II. 428, 446; observations of nature on myxœdema, I. 495; on vascular asthenia, II. 204
Guthrie, Dr., on apoplexy, II. 273 (*note*)
Guttmann on hetol in treatment of phthisis, II. 41; on rheumatism, II. 466

HAFFKINE, PROF., method of anticholeraic vaccination, II. 744
Haig on cause of epilepsy, II. 403
Halford, Sir H., on gout, II. 495
Hallopeau on sodium salicylate in erysipelas, II. 651
Hanot on hypertrophic cirrhosis, II. 157
Hare, Dr., on baths in typhoid fever, II. 686; on hysteria, II. 439
Harvey on cardiac sensibility, I. 411
Hayem, Prof., on green diarrhœa of infants, I. 235; on manganese in anæmia, I. 469
Hearsey, Dr., observations on cases of hæmoglobinuric fever, II. 729
Heller, Dr., on intestinal parasites, I. 297, 300, 303
Henoch on children and renal colic, II. 216
Hérard, Mons., on arsenic in phthisis, II. 47
Héricourt, Mons., on "zomo-therapy" in phthisis, I. 687
Hertz, formula for hypodermic injection in phthisis, II. 75, 77
Hicks on antiseptic inhalations in phthisis, II. 29
Hodgson, Mr., case of aortic disease, I. 416
Hölscher on guaiacol in typhoid fever, II. 680
Hope, Dr., on abstraction of blood in aneurism, I. 442
Horsley, Mr. V., elastic extension in paraplegia, II. 314; "focal epilepsies," II. 423; on neurasthenia, II. 445; on operation for myxœdema, I. 496, 497; operation for trifacial neuralgia, II. 388
Huchard, Dr., on aneurism, I. 445, 450; on angina pectoris, I. 422, 430; on digitalis in cardiac disease, I. 352; on sodium bicarbonate in dyspepsia, I. 166, 167; on treatment of gastralgia, I. 145; on treatment of influenza, II. 711
Hueppe, Prof., on cholera, II. 745, 752, 753
Hunter, Dr. W., on anæmia, I. 472, 475

IMMERMANN on small-pox, II. 618, 621, 624
Ingale, Prof., on hay asthma, I. 594 (*note*)

JACCOUD, Prof., on acute nephritis, II. 235; on cure of acute tuberculosis, II. 94, 96; on exophthalmic goitre, I. 492, 493; on potassium iodide in hepatic cysts, II. 175; on prevention of nephritis in scarlet fever, II. 636; on rectal feeding, I. 39; on treatment of phthisis, I. 693; II. 33, 47, 50, 51.
Jacobi, Dr., on exophthalmic goitre, I. 494; spray in diphtheria, II. 588
Jacoby on chorea, II. 391; on electricity in locomotor ataxy, II. 291, 292; on electricity in neuralgia, II. 326, 327; on hysteria, II. 438; on insomnia, II. 373; on neurasthenia, II. 453 (and *note*); on paralysis agitans, II. 398; on rheumatism, II. 462
Janaway on camphor in typhoid fever, II. 680
Jenner Institute of Preventive Medicine and the bacillus of diphtheria, II. 585 (*note*); instructions as to the use of tetanus

anti-toxin, II. 786—37 ; memorandum as to the use of anti-streptococcic serum in erysipelas, II. 656
Jenner, Sir W., on animal matter in milk, II. 670 (*note*)
Johnston, Capt. C. A., on hypodermic injections in malaria, II. 723
Johnstone, Prof. W. W., on habitual constipation in women, I. 202
Jones-Humphreys, Mr., apparatus for rectal feeding, I. 40
Jurgensen on quinine treatment of pneumonia, I. 608, 611 ; on temperature in pneumonia, I. 614

KATZ, DR., on bromide of camphor in chorea, II. 393
Keen, Mr., operation for trifacial neuralgia, II. 388 ; statistics of perforation of stomach in typhoid fever, II. 690 ; tubercular meningitis, II. 258
Kenny, Dr., on vomiting in utero-gestation, I. 141
Kesteven on oil of eucalyptus in typhoid fever, II. 680
Kirk, Dr., on venesection in renal asthma, II. 250
Klebs-Löffler bacillus of diphtheria, II. 578
Klemperer, Prof., on sciatica, II. 340
Koch, Prof., bacillus of cholera, II. 739 ; tuberculin remedy for phthisis, II. 42–45
Kocher, Prof., on myxœdema, I. 496, 497 ; operation for gastric cancer, I. 98
Koplik on bacillus of whooping-cough, II. 601
Koranyi, Prof. Von, on saline injections in pneumonia, I. 627
Krause on disappearance of gall-stones, II. 120 ; on gout, II. 499 ; operation for trifacial neuralgia, II. 388
Krishaber's (Dr.) method of tubage, I. 35
Krull on injection of cold water in jaundice, II. 182
Küchenmeister, Prof., on treatment of intestinal parasites, I. 292, 297
Külz on milk in diabetes, II. 522
Kussmaul, observations on gastro-ectasis, I. 105, 111, 114 ; on lavage in cancer of stomach, I. 92

LAENNEC on cirrhosis, II. 156
Lafleur on *amœbæ coli*, II. 150, 151
Lamplough, Dr., on creasote in phthisis, II. 34
Lancereaux on cirrhosis, II. 156 ; on gelatinised serum in aneurism, I. 449
Landerer, Prof., on hetol in phthisis, II. 40, 41
Langenbach on gastrectomy for gastric cancer, I. 90
Langton, Mr., case of aneurism, I. 446
Lasègue on blisters in acute rheumatism, II. 563 ; on iodine in osteo-arthritis, II. 477
Lebert on cure of acute tuberculosis, II. 94 ; on pleurisy in acute rheumatism, II. 558
Lecorché, Dr., on gout, II. 491, 494
Lees, Dr., on acute rheumatism, II. 558 ; on meningitis, II. 261
Lenhartz on erysipelas, II. 649, 652, 658
Lépine on bronchorrhœa, I. 546 ; on chronic nephritis, II. 240, 241 ; on diabetes, II. 516, 517, 521, 522, 530, 531, 532, 533, 534, 537
Leube, Dr., on after-treatment of gastric ulcer, I. 83 ; on emetics and lavage in gastro-ectasis, I. 111, 114, 115, 119 ; on Kissengen water in chronic diarrhœa, I. 238 ; on lavage in ulcer of stomach, I. 71 ; on neuralgic colic, I. 192 ; on rectal feeding, I. 60 ; on treatment of gastralgia, I. 145, 146
Leyden, Prof., on strychnine in neuritis, II. 351
Liebermeister on calomel in typhoid fever, II. 677 ; on cholera, II. 750, 756 ; on hot baths in acute nephritis, II. 228
Lister, Lord, on pleurisy, I. 664, 671 ; operation for gall-stones, II. 104
Lobit, Dr., on antiseptics in erysipelas, II. 651
Löffler on ferric perchloride in diphtheria, II. 589
Loomis, Prof., on creasote in phthisis, II. 35 ; on morphine in chronic interstitial nephritis, II. 251
Loreta, Dr., operation for stricture of the pylorus, I. 121
Lowenstein on ozæna, I. 511
Löwenthal on bromoform in whooping-cough, II. 606
Lublesky, Dr., on chorea, II. 395

MACEWEN, DR., on aneurism, I. 448
Mackenzie on morphine in chronic interstitial nephritis, II. 251 ; on thyroid treatment of exophthalmic goitre, I. 495

Maclagan on acute rheumatism, II. 565, 568
Maguire, Dr., on intravenous injection of formalin in phthisis, II. 41, 42
Manson, Dr., on dysentery, I. 255 (*note*), 264; on malaria, II. 714, 720; on thymol in chyluria, II. 202
Maragliano, anti-toxic serum for phthisis, II. 45
Martin, Dr. S., on treatment of intestinal parasites, I. 302
Martin, Prof. E., on treatment of intestinal obstruction, I. 279, 282, 283
Martindale, formula for whooping-cough, II. 606
Maximovitch on naphthols in typhoid fever, II. 679
McCallum, Dr., on sterilisation of syringe in diphtheria, II. 594
Metschnikoff on erysipelas, II. 646
Metzler on exophthalmic goitre, I. 493, 496
Mills, Prof. C. K., on meningitis, II. 262; on neuritis, II. 346, 347, 350
Minkowski on diabetes, II. 516
Minor, Dr., on exophthalmic goitre, I. 494
Mitchell, Dr. J. K., on neurasthenia, II. 447
Mitchell, Dr. Weir, on chorea, II. 396 (*note*); on epilepsy, II. 406; on hysteria, II. 441, 442; on neurasthenia, II. 446, 448, 449, 452; on rest in sciatica, II. 340; rest cure of headache, II. 366; on vomiting in utero-gestation, I. 141
Moncorvo, Dr., on salol in diarrhœa, I. 233
Monti, Prof., on inhalations in diphtheria, II. 605
Moore, J. W., on sodium salicylate in erysipelas, II. 651
Morris, H., on operation in renal colic, II. 218
Moschrowitz on indications for treatment of tetanus, II. 736
Mott, Dr., on cold bath in epilepsy, II. 422
Moutard-Martin on arsenic in phthisis, II. 47
Moynihan on treatment of gastric ulcer, I. 81, 82
Müller, Dr., on hay asthma, I. 592
Murchison on chlorine in typhoid fever, II. 674
Murray, Dr., method of thyroid injection, I. 498; on Hodgkin's disease, I. 482
Musser, Dr., on nitrate of silver in chronic jaundice, II. 134

NAUNYN on biliary calculi, II. 105, 106, 109, 111
Nencki, Prof., experiments on inoculation for cholera, II. 745; on promotion of intestinal asepsis in cholera, II. 752
Nicolaier, discovery of tetanus bacillus, II. 730
Niemeyer on alkaline carbonates in ulcer of the stomach, I. 76; on cold applications in pneumonia, I. 616; on digestion of dyspeptics, I. 61; on emetics in acute bronchial catarrh, I. 536; on gout, II. 494; on mercurial ointment in pleurisy, I. 650; on paraplegia, II. 309; on substitute for Carlsbad water, I. 54; on treatment of phthisis, II. 58; on tubercular meningitis, II. 256, 257, 258
Noorden, Van, on pancreas in diabetes, II. 534
Nothnagel, Prof., on exophthalmic goitre, I. 489, 492

OBET, Dr., on chloral in sea-sickness, I. 137
O'Connor, Dr., on treatment of typhoid fever, II. 684 (*note*)
Oertel, Prof., on inhalations in whooping-cough, II. 603, 604; on styptic solutions in phthisis, II. 78; pneumatic apparatus, I. 598 (*note*)
Oliver, Dr., on symptoms and treatment of lead colic, I. 193, 195, 197
Oppenheim, Prof., on cerebral tumour, II. 277, 278, 280; on epilepsy, II. 402, 406, 415, 417, 423; on headache, II. 357, 359, 361, 362; on hysteria, II. 426, 429, 431, 433, 436, 437, 441, 442, 443; on infantile paralysis, II. 298, 299; on locomotor ataxy, II. 287, 292, 296; on neuralgia, II. 336, 337, 340; on neurasthenia, II. 445, 450, 451; on paralysis agitans, II. 398, 399; on paraplegia, II. 303
Ord, Dr., observations on myxœdema, I. 495, 497; on thyroid treatment of exophthalmic goitre, I. 495
Osler, Dr., on abscess of liver, II. 152; on anti-toxin treatment of tetanus, II. 734; on apoplexy, II. 270; on arterio-sclerosis, I. 437; on bacillus and treatment of diphtheria, II. 579, 580, 594, 595; on bleeding in pneumonia, I. 620; on carcinoma of the stomach, I. 88, 89 (*note*); on cerebro-spinal fever, II. 759, 760; on chorea, II. 385, 395; on chronic interstitial nephritis, II. 248, 251; on chyluria, II. 202; on cirrhosis,

II. 157, 158, 169; on diabetes, II. 529; on diarrhœa of children, I. 228; on diplococcus in scarlet fever, II. 628; on dysentery, I. 262; on epilepsy, II. 414; on endocarditis, I. 332, 338; on exophthalmic goitre, I. 487, 491, 492; on food in phthisis, I. 686; on gall-stones, II. 117, 123; on gout, II. 483; on hæmoglobinuria, II. 200; on hysteria, II. 428; on ice-bag in acute pericarditis, I. 329 (*note*); on jaundice, II. 183; on leukæmia, I. 480; on locomotor ataxy, II. 287, 290, 291; on rheumatism, II. 457, 460, 558; on the symptoms of malarial fever, II. 714; on tubercular meningitis, II. 256; on typhoid fever, II. 684

PAGET, SIR G., on morbid conditions dependent upon gout, II. 483
Papp on vomiting in utero-gestation, I. 140
Paul, Dr. C., on electric bath in chorea, II., 391; on epilepsy, II. 415
Pavy on diabetes, II. 515, 524, 529
Pécholier on creasote in typhoid fever, II. 680
Pepper, Prof., on broncho-pneumonia, I. 638
Peter, Prof., on cardiac pain, I. 412; on food in phthisis, II. 70
Picot, Dr., on hypodermic injections in phthisis, II., 85, 36
Pidoux on treatment of phthisis, II. 64, 73
Pitres on methylene blue in hysteria II. 434
Place, Mr., on carbolic acid injections in tetanus, II. 734
Potain, thoracentesis in pleurisy, I. 653, 654
Powell, Douglas, on aortic disease, I. 376; on malignant endocarditis, I. 338; on nitrites in angina pectoris, I. 431; on phthisis, II. 70; on pneumonia, I. 622

QUILL, SURG.-LIEUT.-COL., on enteric fever, II. 679, 680

RALFE on gall-stones, II. 117, 118
Ransom, Dr. W. B., on scurvy in infants, II. 546
Raymond on neuritis following influenza, II. 710
Reiss on condurango in gastric cancer, I. 96
Remling on cultures of bacillus typhosus, II. 658
Renaut, Prof., on diabetes, II. 531
Renzi on guaiacol, II. 87
Reynolds on epilepsy, II. 406, 418
Richardson on disinfectant treatment of typhoid fever, II. 681, 682
Richet, Mons., on epilepsy, II. 413; "zomo-therapy" in phthisis, I. 687
Riegel on asthma, I. 583
Ringer, Dr., on colic in children, I. 190; on phthisis, II. 47, 77; on vomiting, I. 140
Roberts, J. B., on operation for pericarditis, I. 330
Roberts, Sir W., divisions of dyspepsia, I. 163 (*note*); on acid dyspepsia, I. 159, 164 (*note*); on acute nephritis, II. 227; on gastric cramp in dyspepsia, I. 159; on gout, II. 483, 484, 485, 486, 487, 493, 496, 508; on lithiasis, II., 181, 183, 187, 188, 189; on milk in diabetes, II., 522; on oxaluria, II. 193; on phosphaturia, II. 195; on renal colic, II. 215
Robson, Mayo, observations on dilatation of stomach, I. 103, 105, 121, 122; on absence of bile in health, II. 185; on gall-stones, II. 106, 107, 115, 116, 118, 119 (*note*), 122, 124 (*and note*); on gastrostomy, I. 97, 98; on hæmatemesis, I. 126, 132; on hepatic abscess, II. 149; on treatment of gastric ulcer, I. 81, 82
Rockwell, Prof., on electricity in chorea, II. 391
Rolly on ichthalbin in diarrhœa, I. 234
Rose, Prof. W., operation for trifacial neuralgia, II. 338
Rosenbach on ozæna, I. 511
Rosenstein on Roberts on gout, II. 484
Rosenthal, Dr., on employment of syphon tube, I. 119
Ross, Major Ronald, on malaria, II. 714, 715—17, 724, 730
Ruehle, Prof., on cure of acute tuberculosis, II. 96
Rumpf on angina pectoris, I. 430
Russell, R., on locomotor ataxy, II. 290

SACHS on arsenic in chorea, II. 392
Sansom, Dr., on cardiac disease, I. 351, 355
Schäffer, Dr. M., on induced electric current in asthma, I. 579
Schede, operation for pleurisy, I. 672
Schlatter on gastrectomy in gastric cancer, I. 90

Schmitz, Dr. R., on diabetes, II. 527, 536
Schnitzler, Dr., apparatus for pneumatic treatment of catarrh, I. 556; on laryngeal catarrh, I. 514, 520; on ozæna, I. 511
Schreiber on manometer in pleurisy, I. 658; on massage in sciatica, II. 342
Schwabe on gelatine in nephritis, II. 199
Schwarz on diabetes, II. 537
Sée, Prof., on acute rheumatism, II. 565; on chorea, II. 386; on food in chlorosis, I. 459; on gout, II. 491; on lavage in ulcer of stomach, I. 71; on potassium iodide in chronic interstitial nephritis, II. 248; on treatment of phthisis, II. 36, 50
Seegen, Prof., on diabetes, II. 515, 524, 527, 529
Seguin on arsenic in chorea, II. 392
Semmola, Prof., on chronic nephritis, II. 244; on potassium iodide in chronic interstitial nephritis, II. 248; on potassium iodide in hydatid cysts, II. 175
Senator on bromoform in whooping-cough, II. 606; on diet in gout, II. 508; on fish for albuminurics, II. 240; on sodium benzoate in acute rheumatism, II. 569
Senn, Prof., operation for pleurisy, I. 669; operation for tubercular meningitis, II. 258
Silk, Dr., case of cardiac pain, I. 414 (*note*)
Sinkler, Dr. W., on headache, II. 356, 360, 361; on neuralgia, II. 331, 336; on sciatica, II. 343
Skoda, treatment of pneumonia, I. 607
Smith, Dr. A. H., on diver's paraplegia, II. 315; on rectal feeding, I. 39, 40
Smith, Dr. G., on nutrient enemata in cancer of stomach, I. 90, 91; on puncture of intestine in acute peritonitis, I. 311
Smith, Dr. S., on antiseptics in phthisis, II. 29, 31
Smith, Horton, on disinfectant treatment of typhoid fever, II. 681, 682
Smith, Prof. W., on ergotin in hæmatemesis, I. 130
Smyth, Dr. M., on phthisis, I. 690, 691
Sobernheim on raw meat in phthisis, I. 687
Sokolowski on cold-water treatment of phthisis, I. 695
Spender, Dr., on osteo-arthritis, II. 474
Starr, Prof., on infantile paralysis, II. 300, 301, 302; on locomotor ataxy, II. 290 *et seq.*; on neuritis, II. 348; on paraplegia, II. 313
Steavenson, Dr. W. A., on spasmodic asthma, II. 569 *et seq.*; on osteo-arthritis, II. 476
Stewart, Prof., on gout, II. 494; on osteo-arthritis, II. 475, 476
Stewart, Sir T. Grainger, on angina pectoris, I. 423, 431; on chronic nephritis, II. 240, 241
Sticker, Dr., on oxygen in leukæmia, I. 481; on whooping-cough, II. 605, 607
Still, Dr., on iodoform ointment in tubercular peritonitis, I. 322
Stiller on sanatoria for exophthalmic goitre, I. 489
Stockman on anæmia, I. 457, 464 (*note*), 472, 474
Stokes on counter-irritation in bronchial catarrh, I. 555
Strauss on bacilli in lung, II. 27
Stricker on acute rheumatism, II. 565
Struver, Dr., on gastralgia, I. 149
Swain, Prof., on operation for abscess of liver, II. 155
Sydenham on phthisis, I. 694
Symonds, Charters J., method of tubage, I. 35, 36

TAIT, LAWSON, cholecystotomy for gall-stones, II. 124
Tapret, Dr., on inhalations of creasote in phthisis, II. 37
Teissier, Dr., on naphthols in typhoid fever, II. 679; on quinine in influenza, II. 702
Thaon, Dr., on morphine in phthisis, II. 69
Thiersch, operation for trifacial neuralgia, II. 338
Thoma, Prof., on tubercular peritonitis, I. 323
Thomson, Prof. W. H., on endocarditis, I. 333, 334; on nitroglycerine in aortic disease, I. 375; on pericarditis, I. 331
Thornton, Mr. Knowsley, cholecystotomy for gall-stones, II. 124
Tomassi-Crudeli, on treatment of malarial fevers, II. 725, 727
Toulouse on epilepsy, II. 413
Treves, Sir F., on perityphlitis, I. 242, 243; on posture in acute peritonitis, I. 310; on purgatives in acute peritonitis, I. 316; operation for appendicitis, I. 247, 251, 252; operation for

intestinal obstruction, I. 280–81; operation for pleurisy, I. 667, 668, 669
Trousseau on belladonna in epilepsy, II. 417; on strychnine in chorea, II. 389; on valerian in polyuria, II. 531; on Vichy water in gout, II. 498
Tufnell on rest and starvation in aneurism, I. 442
Turck, Dr. F. B., gyromele for massage of stomach, I. 180
Turnicliffe on Roberts on gout, II. 484
Tyson, Prof., on diabetes, II. 531, 532

ULTZMANN on pyuria, II. 220

VIRCHOW, PROF., on hereditary causation of chlorosis, I. 457; on lungs, II. 25; report on tuberculosis, II. 43
Voisin on cause of epilepsy, II. 403
Von Leyden, observations on tetanus, II. 735
Von Mering on diabetes, II. 516

WALDENBERG, apparatus for pneumatic treatment of catarrh, I. 556
Walther, Dr., on food in phthisis, I. 686
Washbourn, Dr., on dysentery, I. 256, 258 (*note*), 260
Watson, Sir T., on gout, II. 495; on typhoid fever, II. 673, 674
Weber, Sir H. on asthma, I. 582; on phthisis, II. 15, 16; on seaside sanatoria, I. 678
Welch, Prof. W. H., on gastric catarrh, I. 59; on small-pox, II. 618
West, Dr., on chronic interstitial nephritis, II. 250; on diabetes, II. 533
White, Prof. J. W., on operations for cure of epilepsy, II. 422
Whitehead, Mr. W., on headache, II., 362, 367
Whitla, Prof., case of tubercular meningitis, II. 258; on boric acid in ammoniacal cystitis, II. 221; on chorea, II. 393; on cirrhosis, II. 160, 163, 164; on gout, II. 491, 494; on hydatid cysts, II. 175; on intestinal parasites, I. 297; on jaborandi in renal hæmorrhage, II. 198; on operation for abscess of liver, II. 154
Widerhofer, Prof., on causation of acute laryngitis, I. 516; on inhalations in whooping-cough, II. 604; on intestinal parasites, I. 292
Wilcox, Prof. R. W., on hypnotics in insomnia, II. 375, 380
Wilks, Dr., on epilepsy, II. 406, 418; on results of sulphurous acid in typhoid fever, II. 678
Williams, Col., on carbolic acid injections in tetanus, II. 734
Williamson on diabetes, II. 524, 530, 532, 534, 536
Wiltel, operation for trifacial neuralgia, II. 338
Witkowski on pilocarpine in jaundice, II. 137
Wood, Prof. H. C., on digitalis in cardiac disease, I. 350; on enemata in broncho-pneumonia, I. 638; on epilepsy, II. 420; on pneumonia, I. 622; on quinine in chorea, II. 389; on turpentine in typhoid fever, II. 680
Wright, Prof., on scurvy, II. 554; vaccine for typhoid fever, II. 663

ZIEMSSEN, DR., on astringents in chronic laryngeal catarrh, I. 519

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